

THE CITY OF SPRINGFIELD MISSOURI

NPDES Storm Water Permit Annual Report July 2005 – June 2006 and Permit Reapplication



National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System Permit MO-0126322

Prepared by:

Storm Water Services Division Department of Public Works December 2006

Signatory Requirements

As required by Part VI.H of NPDES Permit MO-0126322, this report is signed by a duly authorized representative for the City Manager, a principal executive officer of the City of Springfield, as submitted in writing to the Director on January 16, 2003.

"I certify under penalty of law that this document and all attachments we	ere prepared under my direction or
supervision in accordance with a system designed to assure that qualified	personnel properly gathered and
evaluated the information submitted. Based on my inquiry of the person	or persons who manage the system, or
those persons directly responsible for gathering the information, the info	rmation submitted is, to the best of my
knowledge and belief, true, accurate, and complete. I am aware that ther	e are significant penalties for submitting
false information, including the possibility of fines and imprisonment for	knowing violations."
Todd Wagner	Date
Principal Storm Water Engineer	

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- Fassnight Creek and Lower Jordan Creek Watersheds Field Screening Points
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B SWMP Activity Data

MS4 Inventory

Household Chemical Collection Center

Inventory of Known Major Outfalls

Lab Analysis Sheets:

- Pesticide Data Analysis
- Acid/Base Neutral Organic Analysis
- Volatile Organic Analysis

City of Springfield, MO Biological Assessment of Urban Streams II Final Report

C Educational and Public Outreach Activity Materials

Program Materials:

- Quality Ozark Streams (City Utilities insert)
- Fall Checklist

Activity Announcements:

- Earth Day 2006 Schedule of Events

News Articles/News Releases/Publications:

- Choose Environmental Excellence Newsletter Spring 2006 Earth Day Edition
- Springfield News-Leader "Vote likely in August on park tax extension"
- Springfield News-Leader "Discovery Center uses new material for expansion"
- Springfield News-Leader "Little Sac may suffer from pet waste runoff"
- Springfield News-Leader "Water quality our responsibility"
- Springfield News-Leader "Habitat subdivision may hint at future"

D Permit Reapplication Proposal

1.0 Introduction

This report documents the activities required to fulfill the City of Springfield's (City's) National Pollutant Discharge Elimination System (NPDES) Permit MO-0126322 issued by the Missouri Department of Natural Resources for the City's Municipal Separate Storm Sewer System (MS4), as well as additional activities and components of the City's Storm Water Management Program to reduce the discharge of pollutants from the MS4 and protect the quality of area waterways. This Permit covers a five-year period from July 26, 2002 through July 25, 2007. This annual report provides the necessary documentation to fulfill the reporting requirements specified in Part V.D of the Permit for year four from July 1, 2005 through June 30, 2006. The City's Storm Water Services Division of Public Works compiled this report with assistance and input from Public Works Engineering, Operations, Sanitary Services, Solid Waste Management, and Street Maintenance divisions, along with the Springfield Fire Department, and the Springfield-Greene County Parks Department.

This year's report also serves as the City's reapplication for a new-five year permit as required by Part VI. C. of the current Permit. In preparing this reapplication, the City followed the policy memorandum in Federal Register FRL-5533-7, which states that MS4 permittees may use the fourth annual report as the principal reapplication document. It indicates that permittees may propose changes or improvements to the storm water management program and monitoring activities for the upcoming five year permit term. The draft proposed permit included in Appendix D contains the proposed requirements as noted under each activity in Sections 5.0 and 6.0 of this report.

2.0 Contacts List

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Carrie Lamb Storm Water Technician	417-864-1996	clamb@ci.springfield.mo.us

3.0 Storm Water Management Program Evaluation

A primary objective of Springfield's Storm Water Management Program (SWMP) is the implementation of **Best Management Practices** (BMPs) to protect and enhance the water quality of the MS4. The SWMP elements required in year four of the Permit have been implemented and are discussed in the Narrative Section of this report. The SWMP includes additional elements, which are highlighted below. These accomplishments have made a significant contribution towards enhancing the water quality of the region through sound storm water management principles.



Floodplain Acquisition Program

Following the 1993 floods, a Citizens Storm Water Committee was appointed by City Council to review Springfield's Storm Water Management Program. A primary recommendation of the Committee was the development of a Floodplain Acquisition Program to acquire flood-prone properties and undeveloped acreage within sinkhole boundaries and riparian (stream) corridors.

The City has invested approximately \$12.4 million on this program since 1993. The community has benefited in terms of flood control, wildlife habitat, recreational opportunities, and enhanced water quality as a result of this program. The preservation and restoration of natural vegetation within the floodplains reduces erosion and serves as a filter to remove sediment, nutrients, and other pollutants in storm water runoff.

In addition, the preservation and expansion of buffer areas adjacent to sinkholes serves to protect groundwater quality. The City's sinkhole protection ordinance (City Code Sec. 96-6) restricts development in sinkholes, preventing the creation of new flooding problems while providing water quality benefits. An important tool for implementing BMPs near sinkholes is the *Springfield Area Watersheds and Sinkholes* map that shows the boundaries and watersheds of approximately 250 sinkholes that cover an area of over 600 acres.

Properties acquired during 2005-2006:

Floodplain property:

- 1.4 acres of riparian corridor and floodplain along Fassnight Creek
- 7 acres of vacant land & three residential properties in the Wilsons Creek floodplain

Floodplain and other properties for storm water improvement projects:

- 5.7 acres and residence for regional detention in Thompson Branch watershed
- 4 properties along Fassnight Creek

Other flood-prone properties

- 1 property in the Kirkwood sinkhole area
- 1 property in the Fort & Catalpa sinkhole area
- 1 property on N. Stewart
- 2 properties on N. Newton
- 1 property on E. Washita

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Capital Improvements Program

The citizens of Springfield have placed a high priority on improving quality of life through flood control and water quality enhancements. Voters approved storm water bond issues, funded through a Level Property Tax, in 1995, 1999, 2001, and 2004, totaling \$56 million for storm water capital improvements and floodplain acquisitions. The 2004 initiative also included funding for BMPs and stream bank stabilization projects. Storm water capital improvements funded through bond issues and other sources have evolved from a single-purpose flood control objective to multi-purpose facilities that provide water quality enhancement, wildlife habitat, and recreational opportunities in addition to flood control. Public-private and public-public partnerships have been instrumental in the advancement of multi-purpose facilities. Storm water capital improvement projects completed during year four are summarized below.

Erie Sinkhole to Campbell Avenue Storm Water Improvements. Phase 1 of a two-phase project was completed to provide increased capacity and water quality improvements in the drainage system from Campbell Avenue to the Erie Sinkhole. Phase 1 included acquisition of several properties and removal of the structures, the construction of a large grass channel, a regional detention dam with a trash rack, and retrofitting an existing basin. Drainage from the existing under-sized system will be rerouted to the grass channel with the completion of Phase 2. An existing off-line detention basin was converted to extended detention, and additional runoff from the adjacent commercial development was diverted to this basin. These BMPs will serve to enhance water quality of runoff draining to Erie Sinkhole. Figure 1 shows reinforced turf being installed in the channel. Phase 2 will complete the project with the construction of a new box culvert under Campbell and connection to the new grass channel.



Figure 1 - Erie Sinkhole to Campbell storm water improvement project area



Figure 2 – Reinforced turf mat being installed in the newly constructed channel to the Erie Sinkhole



Figure 3 – Newly constructed grass channel to the Erie Sinkhole

Lombard Street at Kansas Avenue Storm Water Improvements. Improvements were constructed to the existing channel from Kansas Avenue to Kansas Expressway to increase capacity and stabilize the channel. The channel was designed with a natural bottom to provide water quality enhancement and promote infiltration.



Figure 4 – Lombard at Kansas Avenue storm water improvement project area



Figure 5 - Lombard at Kansas Avenue channel improvements

Real-Time Rain Gauge Network

In year four, the City implemented a rain gauge network that will provide near real-time rainfall data from twenty locations across the urban area. The solar-powered gauges use the cellular communications network to transmit rainfall data to a webpage in 15-minute increments. The data transmission is near real-time, displaying on the webpage with an approximate 3-5 minute delay. The Watershed Committee of the Ozarks (WCO) contributed partial funding for the gauges through a grant from the Environmental Protection Agency. The rainfall data will be useful for many of the components of the SWMP, including water quality monitoring, the sanitary sewer infiltration and inflow program, and as an education tool at WCO's future Watershed Center. The rain gauge network can be accessed from the city's website at www.springfieldmogov.org/stormwater.



Jordan Creek Feasibility Study

In the spring of 2004, the US Army Corps of Engineers began a feasibility study to identify cost-effective alternatives to mitigate long-standing flooding concerns and advance environmental restoration along Jordan Creek. Many businesses in the Jordan Creek floodplain experienced damages from the flood that occurred on July 12, 2000. In addition to flood mitigation, alternatives could also address failing infrastructure and other factors to protect water quality in Jordan Creek. The feasibility study will result in a recommended plan for capital projects that will undergo an approval process and subsequent construction. The City is assisting the Corps through a 50/50 cost share agreement with local matching funds and in-kind tasks. The cost of the study is \$3 million and will take an estimated 4½ years to complete. The study continued during year four.



Flood Hazard Mapping

As reported in years two and three, FEMA floodplain areas along South Creek, Jordan Creek, Galloway Creek, and Ward Branch have been remapped as part of a Cooperative Technical Partner agreement with FEMA in which floodplain remapping will be a cooperative effort that utilizes best available information and technology. The supporting models and delineations for these watersheds are currently under technical review and should be available for public comment in the spring of 2007. The City is also developing City Flood Hazard Maps for flood-prone areas that are beyond the designated FEMA flood boundaries. As part of this effort, approximately 4.9 miles of the Inman Creek watershed was mapped in year one. Additional floodplain and flood hazard mapping is scheduled on a priority basis.



Watershed Master Plans

The City continues to work toward the development of comprehensive watershed master plans. As reported in year two, the City implemented a watershed assessment approach in the Jordan Creek North Branch and Inman Creek watersheds to lay the groundwork for future studies. Using this approach, a series of maps is created for a watershed showing the soil types, current and projected future land uses, flood hazard boundaries, MS4 system inventory, and

Permit MO-0126322 7 sinkholes. An interactive flood map is created that provides an instantaneous look at flow rates at various points within the watershed. Also as part of the assessment process, maps of stream buffers are being created to guide the implementation of stream protection buffers for new developments. Consideration is being given to implementing stream protection buffers in new developments as part of the storm water drainage criteria manual currently being developed.

Vision 20/20 Water Quality Planning Group

In 2003, the City and Greene County initiated an effort to continue implementation of the Vision 20/20 Comprehensive Plan developed in the mid 1990's by developing a strategic action plan for the next five years. The citizen-based Planning Groups began meeting in June 2003. The 2004 Vision 20/20 Strategic Plan for Springfield and Greene County containing the groups' recommendations was presented to the City and County on June 24, 2004. The recommendations of the Water Quality Planning Group reflect strong community support for storm water management and other water quality issues and were adopted by City Council and the County Commission as a guide for developing policies to address these issues. The Water Quality Funding Group was subsequently formed to develop possible funding strategies to implement the recommendations of the Water Quality Planning Group. The Water

Quality Funding Group recommended a joint tax initiative with the Parks Department as the most practical short-term funding strategy. The proposed 2006 Parks/Water Quality Tax Initiative was presented throughout the community beginning in early 2006 in preparation for an August 2006 referendum. An article by the Springfield News-Leader about the tax initiative is included in Appendix C.

The Water Quality Funding Group recommended a joint tax initiative with the Parks Department as the most practical short-term funding strategy.



Storm Water Drainage Criteria Revision

In year four, the City, with consultants Wright Water Engineers, Inc. and Intuition & Logic, Inc., neared completion of the draft of the City's storm water drainage criteria manual. The partially completed draft was presented to a review team composed of local engineers and citizens in February 2006. It is a comprehensive document of policies, guidelines, and specific design criteria for storm water management and BMPs. It emphasizes a watershed approach to storm water management that controls flooding for design flood events while protecting water quality, stream channels, habitat and groundwater. The requirement for water quality BMPs on all new developments citywide as detailed in the draft manual was proactively implemented in year three. It is expected that the draft will be finalized and formally adopted by City Council in year five.



Habitat for Humanity LID Subdivision Project

Greene County is working with Habitat for Humanity (HFH) on a cooperative project in which the County is providing the site design of the HFH Legacy Trails subdivision to demonstrate low impact development (LID) concepts to minimize storm water runoff and protect water quality. The subdivision will feature curbless streets and bio-retention areas to minimize and filter storm water runoff, and the use of native plants and grasses to reduce maintenance needs.

The City's Public Works Department provided technical assistance on the design of the subdivision and on implementation of a monitoring study to compare the runoff hydrology and water quality in this subdivision to a traditional subdivision. The Show-Me Yards & Neighborhoods (SMY&N) program is providing technical assistance for

The Legacy Trails subdivision will demonstrate low impact development (LID) concepts to minimize storm water runoff and protect water quality.

the subdivision to meet the program requirements for certification. The project will provide hands-on experience for City and County staff on the practical application of LID concepts and will be a demonstration site that can be used when working with other private developers in the future. In March 2006, a groundbreaking ceremony was held for phase 1 of the subdivision. An article by the Springfield News-Leader about the project is included in Appendix C.

Watershed Center

Planning is underway for the Watershed Center, an education and demonstration facility, at the Valley Water Mill site in north Springfield. The Valley Water Mill Task Force, formed in 2000 as a part of the Watershed Committee of the Ozarks (WCO), has developed a concept plan that includes outdoor classroom "learning stations", trails, a restored

Permit MO-0126322 8 wetland, examples of karst geology, native planting areas, an Audubon Society viewing area, a Mo. Department of Conservation Center fishing dock, and a comprehensive on-site wastewater treatment training center. The Springfield-Greene County Parks Department Outdoor Recreation ~Initiatives program will also be housed at the Center. The Valley Water Mill Task Force Education Sub-Committee drafted an education plan for the Center that includes demonstrations and workshops on storm water BMPs, the Show-Me Yards & Neighborhoods Program, low impact development, and sediment and erosion control. In 2005-2006, much progress was made on this project including construction of the Lakeside Learning Station. More information is available at www.watershedcommittee.org.

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The Discovery Center of Springfield Green Building Expansion Project

The Discovery Center of Springfield, an interactive, hands-on museum and educational resource center, neared completion in year four of its building expansion project that will be LEED-Certified through the U.S. Green Building Council. The project's sustainable design includes a vegetated roof, a storm water collection system for use in toilet flushing and a pervious concrete demonstration area. An article by the Springfield News-Leader about the project is included in Appendix C. City of Springfield staff members from the Planning and Public Works Departments are serving as Volunteer Team Members for the project.

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City Tree Programs

The City provides tree care and maintenance and promotion of community forestry through a number of programs and services. According to American Forests, trees provide measurable benefits in reducing storm water runoff and improving water quality (Beattie 2000). The Public Grounds Section of the Public Works Operations Division is responsible for planting, care, and maintenance of trees on public grounds and rights-of-way. The Springfield-Greene County Parks Department provides tree planting and care on park property. With funding assistance from the MO Dept. of Conservation Tree Resource Improvement and Maintenance (T.R.I.M.) program, Public Grounds conducted a

city tree inventory in 2001 that identified the city's tree potential as well as assessing the health, size distribution, diversity, and maintenance needs of existing city trees. This information continues to provide guidance in improving the city's urban forest.

In 2005-2006, 605 trees were planted and 216 trees were removed for a net increase of 389 trees on public grounds, street rights-of-way, and parks property. In April 2006, the City received the Tree City USA designation from the National Arbor Day foundation for the 21th consecutive year. City tree programs include the NeighborWoods tree planting program, Springfield Tree Registry, Tree Planting Permit Program, and Removal Replacement Program. Ozark Greenways also offers the Tree Keepers program that provides training and opportunities for volunteers in proper care of urban and community trees. Public Works cosponsors a city Arbor Day celebration annually.



Figure 6 - Quail Creek neighborhood residents and Public Works staff working together to plant trees as part of the Neighborwoods program.

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Evaluation - Major Findings

Voluntary efforts by citizens and businesses are an extremely valuable part of a successful storm water management program and should continue to be encouraged

management program and should continue to be encouraged through public education and outreach. The Adopt-A-Stream program, providing opportunities for volunteers to help keep waterways in Springfield clean, had a successful first year in 2005-2006 with approximately 30 cubic yards of trash collected.

Voluntary efforts by citizens and businesses are an extremely valuable part of a successful storm water management program.

Pollution reporting by citizens, another voluntary effort, continues to be an important tool in illicit discharge detection and elimination as detailed in Activity 7.c.

Mapping of the MS4 has proven to be a valuable tool for illicit discharge investigation, development of the Field Screening Program, watershed planning, and other storm water management activities. The MS4 is estimated to total over 11,000 point features and approximately 500 miles of infrastructure. During year four, approximately 16% of the MS4 was mapped, bringing the total mapped to approximately 69% of the entire system. Statistics on the inventory are included in Appendix B.

Evaluation – Program Strengths

- Many of the goals of the Storm Water Management Program and the Springfield-Greene County Parks Department share common objectives that result in mutually beneficial programs and partnership opportunities. In 2006, the Vision 20/20 Water Quality Funding Group recommended a joint tax initiative with the Parks Department as the most practical short-term funding strategy. The proposed 2006 Parks/Water Quality Tax Initiative was presented throughout the community beginning in early 2006 in preparation for an August 2006 referendum. An article by the Springfield News-Leader about the tax initiative is included in Appendix C.
- Since 1993, the citizens of Springfield have continued to demonstrate increased public support for implementation of sound storm water management practices. Voters passed initiatives for storm water funding in 1995, 1999, 2001 and 2004. Water quality has become an increasing priority among citizens and civic leaders, as shown in the Vision 20/20 five-year action plan. The Vision 20/20 Water Quality Planning Group is providing goals and objectives for storm water management in the future.
- Since 1993, the City has invested approximately \$12.4 million in Floodplain Acquisition Program funds to acquire flood-prone properties as well as undeveloped acreage within sinkholes and along waterways. The preservation of riparian corridors and the adjacent floodplains is basic to meeting the needs and expectations of the community in terms of water quality, flood control, wildlife habitat, greenspace and recreation.
- The City continues to offer a comprehensive education and public outreach program on water quality issues through a variety of components summarized in Section 5.10 of this report. The City partners with an outstanding network of individuals, agencies, and organizations on these efforts.

The City partners with an outstanding network of individuals, agencies, and organizations providing education and outreach.

- Since 1995, the City has committed over \$16 million to a comprehensive Infiltration and Inflow (I/I) Program. The I/I Program reduces the incidence of sanitary sewer overflows into the storm water system through a proactive Sewer System Evaluation Survey. The Sewer System Evaluation Survey was completed system-wide in June 2003. The City is continuing rehabilitation of the system. In 2005-2006, 12,020 lineal feet of sanitary sewer lines and 182 manholes were rehabilitated. In 2007, efforts will begin to address private-side I/I as detailed in Section 5.7. Ten percent of sanitary sewer revenues are earmarked to finance ongoing I/I efforts.
- Southwest Missouri has demonstrated broad based support for protection of water resources due in large part to the strong connection between water resources, the tourism industry and quality of life in the Ozarks. This support is evident in the outstanding network of organizations, agencies, and individuals that contribute to water protection efforts and through coverage of water quality issues by the local media including the Springfield News-Leader, TV networks, and other local publications.



Evaluation – Program Weaknesses

In May 2003, Mr. Jonathan Jones, P.E., of Wright Water Engineers, Inc. in Denver, Colorado, provided City Council with an evaluation of Springfield's Storm Water Management Program from a national perspective. While the evaluation ranked the program favorably, it targeted areas for improvement to strengthen the program in the future. In addition to successfully administering and complying with the requirements of the NPDES permit, Mr. Jones' priority recommendations included:

- 1. Increase permanent funding for system maintenance, staffing, administration and operations. Evaluate and propose a permanent funding source.
- 2. Initiate targeted watershed planning.
- 3. Develop a comprehensive drainage criteria manual.
- 4. Obtain authority to require grading plan in development submittal process.
- 5. Implement Pearson Creek, South Dry Sac and sinkhole water quality requirements citywide.
- 6. Enact ordinances regarding adoption of drainage criteria manual and master plan, and provide City authority to require grading permit.
- 7. Increase public education and involvement, in general.
- 8. Continue to improve water quality, especially in the James River Basin.
- 9. Continue to prepare detailed flood hazard maps.
- 10. Implement pilot projects regarding new storm water and stream channel management practices, such as "lowimpact development" and "bioengineering" for stream channel stability.
- 11. Continue acquisition of flood-prone structures and preservation of riparian corridors.
- 12. Encourage multi-purpose facilities that are valuable community assets, like the YMCA detention basin, including partnerships to create such facilities.
- 13. Adopt a more proactive approach to erosion control at construction sites, emphasizing education.

Many of these targeted areas are being addressed within current budgetary and staffing limitations.

- 1. The Vision 20/20 Water Quality Funding Group recommended a 2006 joint tax initiative with the Springfield-Greene County Parks Department as a short-term funding strategy. It is anticipated that a long-term funding study will begin in 2007.
- 2. The City continues to lay the groundwork for watershed planning through development of enhanced flood hazard maps, watershed assessments, mapping of the storm water system citywide, and mapping of buffers along waterways.
- 3. A comprehensive storm water drainage criteria manual has been drafted. Finalization of the draft and adoption by City Council is anticipated to be completed in 2007.
- 4. The implementation process for a grading permit requirement is planned to begin in 2007.
- 5. Water quality requirements have been implemented citywide as detailed in Activity 2.a.
- 6. Ordinances adopting the drainage criteria manual and master plan and providing City authority to require a grading permit will be considered in accordance with the finalization of the draft manual and based on the schedule contained in the Vision 20/20 5-year action plan.
- 7. Public education and involvement is continually increasing as the City's Storm Water Management Program expands. Section 5.10 of this report summarizes the City's education efforts.
- 8. The City, as well as the outstanding network of organizations and agencies in the area, is continually working to improve water quality in the James River Basin. The City's efforts, as well as some of the efforts of these other entities, are detailed in this report.
- 9. The City is continuing to develop detailed floodplain maps as well as flood hazard maps for areas beyond the designated FEMA boundaries. These efforts are discussed in Section 3.0 Flood Hazard Mapping.
- 10. As detailed above in Section 3.0:
 - a. The City provided technical assistance on a low impact development (LID) design by Greene County for a Habitat for Humanity subdivision.

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- b. The Erie Sinkhole to Campbell storm water improvement project utilized BMPs to enhance water quality.
- c. A creek daylighting project was completed using bioengineering concepts on Jordan Creek North Branch during year three. Phase 2 of this project will be completed in year five.
- d. Stream and lake bank stabilization projects utilizing bioengineering concepts are planned as part of the 2006 Parks/Water Quality Tax Initiative.
- 11. The City continues to acquire flood-prone properties and undeveloped acreage within sinkhole boundaries and along riparian corridors as summarized in Section 3.0 Floodplain Acquisition Program.
- 12. The City continues to explore opportunities to create multi-purpose facilities. Storm water improvement projects completed in year four are discussed in Section 3.0 Capital Improvements Program.
- 13. The City is working to adopt a more proactive approach to erosion and sediment control at construction sites through additional staffing and potential implementation of a grading permit requirement.

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Evaluation - Future Direction of the SWMP

The future direction of the SWMP program will be guided by the city's renewed permit following the end of this permit term in July 2007. As indicated in the Introduction, this report serves as the city's principle reapplication document. The proposed permit for the renewal term is included in Appendix D.

The passage of the ½ cent Parks/Water Quality Tax in August 2006 (after permit year-end but before compilation of this report) will allow sweeping improvements to water resource management in Springfield and Greene County. Half of the tax revenue is dedicated toward countywide water resources projects and programs including the following:

- Enhancement of deteriorated streams and lakes in at least 5 parks
- Acquisition of floodplains for riparian preservation and trail development
- Improved waterway maintenance
- Development of linkages between neighborhoods and major greenways along tributary waterways
- Improvements to the program to reduce erosion and discharge of sediment from construction sites
- Improved watershed planning and water quality education

4.0 SWMP Summary Table

The SWMP Summary Table on the following page has been prepared according to the format outlined in Part V.D.2.c. of the Permit. The table documents program activities that are quantifiable. Some activities could not be quantified and therefore do not appear in the summary table but are discussed in Section 5.0 Narrative Report.

Table 1 - Storm Water Management Program Summary Table

	I able t - Stollil Wa	ıcı manayen	Storini Water Management Frogram Summary Table	
Task	Required Schedule	Schedule Adhered?	Activities Accomplished	Available Documentation & Comments
MS4 Inventory	Existing schedule (1 FTE)	Yes	Estimated 16% mapped, bringing total to 69% of system	Section 5.1, Activity1.a; Appendix B
Inspections of MS4 quality control structures	Periodic	Yes	23 city-owned basins inspected	Section 5.1, Activity 1.b
Floatables removal (grate inlets, waterways, bridge, and sinkhole routes)	Existing schedule (As needed)	Yes	3,729 locations cleaned (including locations cleaned more than once	Section 5.1, Activity 1.c
Cleaning roadway inlets and catch basins	Existing schedule (As needed)	Yes	Catch basin cleaned biannually; Cleaning of roadway inlets not tracked separately	Section 5.3, Activity 3.d
Street Cleaning	Existing schedule (weekly/bimonthly)	Yes	800 tons of sweepings and 1104 cubic yards of leaves collected	Section 5.3, Activity 3.b
Dry-weather field screening	50 points/year	Yes	50	Field Data Sheets; Section 5.7, Activity 7.b
Wet-weather field screening	25 points/year	No	25	Below average rainfall limited sampling opportunities. See Section 5.7, Activity 7.b
Illicit Discharge/pollution report investigations	As needed	Yes	21	Section 5.7, Activity 7.d
Infiltration and Inflow Program	N/A	N/A	12,020 lineal feet of sanitary sewer lines and 182 manholes rehabilitated	Quarterly reports to MDNR; Section 5.7, Activity 7.9
Representative Monitoring (Stream Sampling)	6 sites 4 times/ year	Yes	6 sites 4 times/year	Section 6.3, Table 9.
Education	N/A	N/A	1 City Utilities bill insert distributed to 98,000 customers; 65 storm drain markers 24 presentations 12 displays 5 workshops/seminars 9 tours	See Section 5.10 for full summary of activities
Tree Planting	N/A	N/A	389 trees (605 planted and 216 removed) on public grounds, street rights-of-way, and parks	Section 3.0 City Tree Programs

5.0 Narrative Report

The purpose of this section of the report is to discuss those SWMP elements required for development under Parts II and III of the Permit. The activities for each element are identified with their corresponding number and letter listed in Part II.A of the Permit.

5.1 - Operation and Maintenance of Structural Controls

Activity: 1.a - Continue to update and maintain the inventory data for the MS4 within the City boundaries.

The City currently has one full-time position assigned to inventory and map the MS4. The inventory data includes seven major components in two categories:

- Linear Features
 - 1. Pipe
 - 2. Box Culvert
 - 3. Channel
- Point Features
 - 4. Inlet
 - 5. Junction Box
 - 6. Detention Basin
 - 7. Bridges

These point and linear features are identified through the use of construction plans and aerial photography, as well as field



Figure 7 - GIS mapping of the MS4

verification and other documentation available. These features are digitized with the use of GIS software. Information about these structures is recorded in a corresponding database. This data aids in investigation of spills and illicit discharges in addition to being a useful tool for maintenance activities and watershed planning. During year four, approximately 16% of the MS4 was mapped, bringing the total mapped to an estimated 69% of the entire system. Statistics on the inventory are included in Appendix B. Sinkholes within the City have also been mapped with the use of GIS software and represent an eighth feature type in the MS4.

Permit Reapplication: This activity will be continued as proposed in Appendix D.

Activity: 1.b - Develop and implement a program for periodic inspections of the storm water quality control structures.

The City currently owns and maintains 22 detention basins and one catch basin. In addition to mowing, maintenance on these basins is performed as needed. Basins are inspected for structural condition, vegetation condition, and the presence of trash, debris, and deposits. Table 2 shows the inspection results and maintenance completed on each basin in year four.

Permit Reapplication: This activity will be continued as proposed in Appendix D, as Activity 2.b.

Table 2 – City-Owned Detention Basin Maintenance

		Table 2 - City-	Owned Detentio	n Basin Maintenand	
Basin #	Location	Structural Condition	Vegetation Condition	Trash/debris/deposits	Maintenance Completed
1	2200 block S Kansas Expy	Good	Good	Car tire	Removed tire
2	NE corner National/Sunshine	Good	Good	None	None
3	1400 block S Weller	Good	Good	Sediment accumulation	Removed sediment
4	SW corner Billings/Westgate	Good	Good	Sediment accumulation	Removed sediment
5	2500 W Chestnut Expy	Good	Good	Sediment accumulation	Removed sediment
6	2100 block W Melville Rd	Good	Good	Sediment accumulation	Removed sediment
7	2100 block N Alliance	Good	Good	Sediment accumulation	Removed sediment
8	1900 block N Alliance	Good	Good	Sediment accumulation	Unable to remove sediment due to constant standing water
9	400 block N Cedarbrook	Good	Good	Sediment accumulation	Removed sediment
10	2100 block E Pythian	Good	Good	None	None
11	2000 block E Pythian	Good	Good	None	None
12	2700 block E Blaine	Good	Good	Debris accumulation	Removed debris
13	2600 block N LeCompte	Good	N/a (wet basin)	None	None
14	4300 block E Mustard Way	Good	Good	None	None
15	2300 block S Blackman	Good	Good	None	None
16	SE corner Meador Park	Good	Good	None	None
17	SW corner Carleton/Bothwell	Good	Good	Debris accumulation	Removed debris
18	2000 block E Republic	Good	Good	None	None
19	1900 block S Linden	Riser pipe outlet rock filter clogged	Good	Sediment/trash accumulation	Replaced rock; removed sediment/trash
20	NW corner Kimbrough/Walnut Lawn	Good	Good	None	None
21	1451 E Primrose	Good	Good	None	None
22	SE corner Lakewood/Ash	Good	Good	Good	None
23	SE corner Arlington/LaMonta	Good	N/A (concrete catch basin)	Debris/sediment accumulation	Removed debris/sediment

Activity: 1.c - Continue existing maintenance program by periodic collection and removal of floatables from the MS4 to the Maximum Extent Practicable (MEP).

The Bridge & Waterways Section of Public Works routinely checks and removes debris from the MS4 after rain events. This scheduled maintenance activity consists of four route types:

- Bridge route with 10 priority locations
- ▶ Sinkhole route with 12 priority locations
- Waterway routes, north and south, with 85 priority locations
- 12 grate routes with over 1700 priority locations

The Bridge & Waterways Section of Public Works removed debris at 3,729 locations in the MS4 during year four.

Maps of these routes were included in the first and second annual reports. During year four, debris was removed at 3,729 locations (this number may include duplicate locations cleaned more than once). The decrease in the number of locations cleaned compared with year three is likely due to drought conditions resulting in less debris accumulation in the MS4. The two monitoring locations designated for the removal of floatable materials as required in Part V.B. of the Permit are reported in Section 6.4 of this report.

Permit Reapplication: This activity will be continued as proposed in Appendix D.

5.2 - Control of Discharge from Areas of New Development and Significant Redevelopment

Activity: 2.a — The City's existing water quality protection policy requiring storm water BMPs for the Fulbright Spring, Pierson Creek, and sinkhole watersheds will continue and consideration will be given to include all the remaining areas of the city served by the MS4.

In year four, the City, with consultants Wright Water Engineers, Inc. and Intuition & Logic, Inc., neared completion of the draft of the City's storm water drainage criteria manual. The draft was presented to a review team composed of local engineers and citizens in February 2006. It is a comprehensive document of policies, guidelines, and specific design criteria for storm water management and BMPs. It emphasizes a watershed approach to storm water management that controls flooding for design flood events while protecting water quality, stream channels, habitat and groundwater. It is expected that the draft will be finalized and formally adopted by City Council in year five.

In the interim, the requirement for water quality BMPs on new developments citywide was implemented in year three and continued in year four. Properly designed BMPs are required to capture the greater of either the 90th percentile rainfall over the entire development or the first flush rainfall from all impervious area within the development. The water quality capture volume to be used in the design of BMPs to meet this requirement is the greater of the following:

- the first one-half inch of runoff from the directly connected impervious area in the development, or
- the runoff resulting from a rainfall depth of one inch in 24 hours over the entire development

This requirement applies to the following development scenarios:

- All new developments in the "sensitive watersheds" (Fulbright Spring, Pearson Creek, and sinkhole watersheds)
- For new developments not in the sensitive watersheds, but within 500 feet of a sensitive waterway, the requirement is applicable to:
 - o New residential development greater than 1 acres
 - o New commercial/industrial/multi-family development greater than 0.5 acres
 - Other improvements resulting in more than 2/5 acres of impervious area
- For new developments not in the sensitive watersheds or within 500 feet of a sensitive waterway, the requirement is applicable to:
 - O New residential development greater than 5 acres

- O New commercial/industrial/multi-family development greater than 2.5 acres
- Other improvements resulting in more than 2 acres of impervious area



Figure 8 - Grass swale and water quality detention basin



Figure 9 – Gravel filter and perforated riser pipe maximize detention and settling time for sediment and other pollutants.

Permit Reapplication: This activity will be continued as proposed in Appendix D.

5.3 - Roadways

Activity: 3.a - Review current deicing practices, implementing changes where feasible to minimize the discharge of pollutants to the MS4.

The City's current deicing practices emphasize providing safe driving conditions on municipal streets while also minimizing the potential for deicing materials to discharge into the MS4. The Street Maintenance Division uses rock salt, liquid salt brine and liquid calcium chloride for deicing the City's streets. To prevent contact with storm water, salt is stored in the City's salt dome located in center city as well as in a second storage facility constructed in year two in southwest Springfield. This joint use facility provides ample salt storage, eliminating previous storage on a tarp-covered pad, and more efficient operations for both the City and Greene County.

In 1997, the Street Maintenance Division began researching and experimenting with different application rates for deicing materials. Prior to this time, the Division was using the nationally recommended rate of 500 pounds of rock salt per lane mile. It was determined that an effective level of ice and snow removal for public safety could be provided using a reduced rate of 200 pounds per lane mile. The following practices used by the Division help to provide an effective level of ice and snow removal while minimizing the discharge of salt and calcium chloride to the MS4.

- Liquid calcium chloride and liquid salt brine are used to pre-wet the rock salt before it is sent to the spreader. Adding liquid calcium chloride or salt brine to rock salt helps shorten the reaction time of the rock salt and provides melting action at lower temperatures. Pre-wetting the rock salt also decreases the salt "bounce off" effect when the salt hits the road, thereby keeping more salt on the roadway and out of roadside ditches. Salt brine is used to pre-wet the rock salt until the temperature drops to 24°F, below which salt brine is not effective and calcium chloride is used.
- When the temperature is high enough that precipitation will start as rain before turning to snow, the Division waits until the snow occurs to apply rock salt to the roadway. If rock salt is applied before the rain turns to snow, the rock salt may get washed into the storm water system.

Permit Reapplication: This activity will be continued as proposed in Appendix D.

Activity: 3.b -The City will continue its existing street sweeping program on all curb and gutter streets, which includes proper disposal of the street sweepings.

The Street Maintenance Division sweeps and cleans all curbed streets in the City on a rotating schedule. Collector and residential routes are cleaned every 6 weeks during peak leaf season and every 4 weeks otherwise. During peak leaf season, the street sweepers also clean out ditches along the routes. Arterial roads continue to be swept weekly. The 986 curb miles that are cleaned are organized into 66 collector and residential street routes and 9 arterial street routes. During an average eight-hour shift, a sweeper can clean approximately 10 to 15 curb miles depending on conditions such as peak leaf season. The street sweeping schedule is accomplished with nine full-time street sweeping positions. During year four, the City's street sweepers collected 800 tons of street sweepings and 1104 cubic yards of leaves, which were taken to the City's Yardwaste Recycling Center. In addition, the Division routinely picks up debris such as tires,

couches, appliances, and bags of trash that are left on the City's right-ofways, as well as providing cleanup in response to spills, accidents and special events such as parades. The Missouri Department of Transportation (MoDOT) sweeps and cleans state-maintained thoroughfares within the city limits.

The City's street sweepers collected 800 tons of street sweepings and 1104 cubic yards of leaves in 2005-2006.

Permit Reapplication: This activity will be continued as proposed in Appendix D.

Activity: 3.c – The city will review its current street design, construction, and maintenance requirements in environmentally sensitive areas; such as those adjacent to streams, wetlands, and floodplains; and incorporate BMPs to the MEP.

During year four, the city developed BMPs for handling of concrete slurry produced from pavement grinding or milling operations to prevent discharge to the MS4. Contractors on city-funded projects will be required to submit a plan for implementing these BMPs. City crews will also be required to follow these BMPs. Concrete slurry handling guidelines are also posted on the city website at www.springfieldmogov.org/stormwater. The discharge of concrete slurry to the MS4 from private projects will be investigated as an illicit discharge. For street design, it is anticipated that a curbless street standard will be adopted in year five for use in projects designed with low-impact development techniques. The city will continue to incorporate additional BMPs in street design, construction, and maintenance to the MEP as needed.

Permit Reapplication: This activity will be continued as proposed in Appendix D for street maintenance BMPs. Future activities relating to street design BMPs will be reported on under Activity 2.a proposed in Appendix D. Future activities relating to street construction BMPs will be reported on under Activity 9.a proposed in Appendix D.

Activity: 3.d - Continue routine cleaning of grated inlets, roadway storm water inlets, and catch basins.

The Bridge and Waterways Section of Public Works administers an established program of cleaning the storm water conveyance system after rain events. This program includes 12 grate routes covering over 1700 storm grates. The grate route work orders include instructions to clean all pipes and inlets along the route. Maps showing the locations of these routes were included in the first and second annual reports.

The U.S. Environmental Protection Agency defines catch basins as "...chambers or sumps, usually built at the curb line, which allow surface water runoff to enter the storm water conveyance system. Many catch basins have a low area below the invert of the outlet pipe intended to retain coarse sediment" (US EPA 1999). There is one catch basin in the City that has the defining characteristic of a low area below the flow line meant to retain sediment and debris. This catch basin, located above the upper lake in Southern Hills neighborhood, is cleaned twice per year. The City's sub-inlet chambers generally do not collect debris because the bottoms of the chambers are at the same elevation as the flow line. In some cases, debris can accumulate if the pipe outlet becomes clogged. These chambers are cleaned on an as-needed basis.

Permit Reapplication: This activity is included as part of the proposed Activity 1.c in Appendix D.

5.4 - Flood Control Projects

Activity: 4.a — Continue to assess the impacts on the water quality of receiving waters from flood management projects using procedures and criteria established for storm water grant applications.

The City continues to consider water quality protection in the design of flood control projects. The criteria from 10 CSR 20-4.061 Storm Water Grant and Loan Program are used for guidance on storm water improvement projects and must be addressed on applications for state funding for projects. In addition, the draft storm water drainage criteria manual completed in year four contains guidelines on preserving existing natural channels and designing channels using bioengineering techniques.

Flood control projects completed in year four are reported in Section 3.0. The Erie Sinkhole to Campbell project was designed with features for water quality enhancement of runoff draining to the sinkhole. The Lombard at Kansas project provided for stabilization of the existing channel to correct erosion and features a natural bottom for infiltration and water quality enhancement.

Permit Reapplication: This activity will be continued as proposed in Appendix D.

Activity: 4.b – Evaluate existing major flood control facilities for retrofitting with storm water quality controls

In year four, an existing detention basin was retrofitted as part of the Erie Sinkhole to Campbell Storm Water Improvement Project as reported in Section 3.0. The outlet was retrofitted to provide for water quality treatment prior to discharge to the sinkhole. In addition, the capacity of the basin was increased and upstream drainage that previously bypassed the basin was rerouted to the basin to provide treatment. The detention basin outlet before and after the project is shown in Figures 13 and 14. A regional detention area was also created adjacent to this basin with the installation of a detention dam designed with racks to collect trash and debris.



Figure 10 – Detention basin outlet prior to retrofitting.



Figure 11 – Detention basin outlet retrofitted with perforated weir plate and gravel filter.

Permit Reapplication: This activity will be continued as proposed in Appendix D.

5.5 - Program to Monitor Pollutants in Runoff from Municipal Waste Management Facilities that are not Permitted by a Separate Permit

Activity: 5.a – The City will continue to study its municipal waste management facilities and determine if additional BMPs are needed to control pollutants to the MS4 and, if so, develop a schedule for implementation.

As reported under Activity 5.b, there are no active municipal waste management facilities within the City limits. The Springfield Sanitary Landfill is located outside the city limits and is permitted by a separate permit. Previous municipal waste management sites are discussed in Activity 5.b.

Permit Reapplication: This requirement is addressed in Appendix D.

Activity: 5.b - Establish, as part of the field screening program, a monitoring and inspection program for municipal waste management facilities.

There are no active municipal waste management facilities within the City limits. The Springfield Sanitary Landfill is located outside the city limits and is permitted by a separate permit.

As reported in Part I of the application for this Permit submitted in 1992, there are four closed landfills within the City limits as well as two fill areas that received demolition debris and possibly some municipal waste. There are also three sites where the City's early wastewater treatment plants were located. Two of these sites are at the same approximate location as two of the closed landfills. The locations are described below:

- 1. The Talmage Street City Dump was located at the NW corner of Talmage Street and Benton Avenue. This area drains to field screening point #163 which was sampled on 12/6/04. Phase 1 and Phase 2 Environmental Site Assessments were conducted on this property in 2005 and 2006.
- 2. The Eastgate Landfill was a privately owned site located at the NE corner of Catalpa Street and Eastgate Avenue. This area drains to field screening point #27.
- 3. The Loren Street City Dump and the Catalpa Street Treatment Plant were both located on the north side of the 2100 block of W. Catalpa Street. This site is now a city park referred to as Loren Street Park. It is located adjacent to Jordan Creek approximately 1500 ft upstream from Bennett Street at which Jordan Creek is monitored as part of the Representative Monitoring Program. A Phase 1 Environmental Site Assessment was conducted on this property in 2002.
- 4. The Bennett Street City Dump and the Wilsons Creek Treatment Plant were both located at the SE corner of Bennett Street and Scenic Avenue, which is now Jim Ewing Park. This area is adjacent to Wilsons Creek approximately 2.5 miles upstream from Farm Road 146 at which Wilsons Creek is monitored as part of the Representative Monitoring Program. A Phase 1 Environmental Site Assessment was conducted on this property in 2006.
- 5. The Walnut Street site located at the NW corner of Walnut Street and Fort Avenue was a privately owned site that was used for demolition and some municipal waste. This area is adjacent to Jordan Creek approximately 1.5 miles upstream from Bennett Street at which Jordan Creek is monitored as part of the Representative Monitoring Program. A commercial business has been located on this site for many years.
- 6. The National Avenue Landfill was located at the NW corner of National and Trafficway and is an old quarry site that was used for clean fill only (construction materials and concrete). A Phase 1 Environmental Assessment and a Pond Characterization Report were conducted on this site in 1998. This site is now owned by the city and has been filled in over the past year. Plans are being made for future uses of this site as part of Jordan Valley Park.
- 7. The Pea Ridge Creek Treatment Plant was located north of Doling Park. This plant was closed by the 1930's. This area drains to field screening point #163 which was sampled on 12/6/04.

Permit Reapplication: This requirement is addressed in Appendix D.

5.6 - Use of Pesticides, Herbicides, and Fertilizers (PHFs)

Activity: 6.a - Continuation of public education program to promote the proper use, handling, storage, and disposal of PHFs through the Integrated Solid Waste Management System.

The Solid Waste Management and Storm Water Services Divisions of Public Works provide the public with educational information on the proper use, handling, storage, and disposal of pesticides, herbicides, and fertilizers (PHFs). Information about the Show-Me Yards & Neighborhoods (SMY&N) Program and the Household Chemical Collection Center (HCCC) is featured at education and outreach opportunities as summarized in Section 5.10 of this report, including community events such as the Home Show and Lawn & Garden Show with average attendance numbers of 17,000 and 14,000 respectively. Both the SMY&N Program and the HCCC were also highlighted on the *Quality Ozark Streams* flyer included in City Utilities bills distributed to approximately 98,000 customers in October 2002, 2003, 2004, and again in January 2006. This flyer is included in Appendix C. The SMY&N program and services of the HCCC are described in more detail below.

SMY&N education and outreach activities are designed to raise awareness of the significant role lawns play in the total amounts of nutrients and pollutants in storm water runoff flowing to area waterways. SMY&N offers environmentally responsible lawn and landscaping tips, including proper use of PHFs. Individuals and professionals who put the SMY&N techniques into practice are recognized and commended – homeowners can earn an attractive yard sign and professionals can become certified. Professionals have been particularly responsive to the program, with 65 professionals receiving certification to date. Professionals receive periodic mailings that provide tips, reminders, and other information.

The SMY&N Phase II 319 mini-grant from the Missouri Department of Natural Resources was completed in December 2003. The program continues with funding and support from



Figure 12 – The Yard Rx series produced by TV23 is based on the SMY&N principles.

Public Works, the Watershed Committee of the Ozarks, James River Basin Partnership, and other organizations. SMY&N will be a component of the education program at the new Watershed Center for which plans are underway as discussed in Section 3.0. SMY&N produces and distributes two booklets – *Cool Season Grasses Lawn Care & Maintenance Calendar* and a general information booklet referred to as *Take Home Tips* that were developed in December 2003 and included in the second annual report. In year four, the City's TV23 Government Cable channel began producing a series of monthly segments titled "Yard Rx" based on the SMY&N principles. The following segments aired daily on TV23 throughout the month in 2006:

- o February Soil Testing: The importance of soil testing to determine what, if any, nutrients are needed to avoid over-fertilization.
- o March Organic Fertilizers: The advantages of using organic fertilizers in nurturing a healthy yard, reducing the need for pesticides, herbicides, and high dose chemical fertilizers.
- O April Compost and Mulch: The uses of compost and mulch available at the City's Yardwaste Recycling Center to amend soils and retain moisture.
- o May Rain Barrels: Connecting downspouts to rain barrels to utilize rain water for irrigation and reduce storm water runoff.
- O June Water Conservation: Lawn practices to conserve water.

Additional segments have been developed and will be reported in the annual report for year five. In addition to being aired on TV23, these segments are also available for viewing along with other program information on the SMY&N webpage at www.springfieldmogov.org/showmeyards.

The HCCC is available to Springfield and Greene County residents for proper disposal of unneeded household chemicals, including PHFs. The Solid Waste Management Division produces and distributes a brochure that provides information about visiting the HCCC and guidelines on proper storage and handling of household chemicals. This information is also available on the Division's web page at www.springfieldmogov.org/recycling. In 2005-2006, 2,477 appointments were made to use the HCCC, resulting in 79,930 lbs. of household materials being collected. Of this total, 85% or 68,220 lbs. were recycled. A total of 1,070,611 lbs of materials have been collected since the HCCC opened in 1994. A breakdown of materials collected is included in Appendix B. Tours of the HCCC are given to school classes and other interested groups, as listed in Section 5.10.

Permit Reapplication: This activity will be continued as proposed in Appendix D.

Activity: 6.b - Review municipal usage of PHFs on public properties and rights-of-ways to determine the effectiveness and feasibility of using alternatives to PHFs

The Public Grounds Division of Public Works and the Springfield-Greene County Parks Department require that all pesticides, herbicides, and fertilizers (PHFs) be applied under the direct supervision of a Missouri licensed certified public operator as required by state law.

The Public Grounds Division uses herbicides to minimize species that require frequent mowing, particularly on street medians. Fertilizers are typically used only to promote reseeded areas and as part of the lawn care program designed for the Government Plaza. In these instances, a low-nitrogen, low-phosphorous product that focuses on promoting root growth is used. The Division's Grounds Maintenance Crew Leader has completed the Show-Me Yards & Neighborhoods Lawn Care Professionals Certification Program in commitment to environmentally sound lawn care practices, including minimum usage of PHFs.

The Springfield-Greene County Parks Department uses PHFs to maintain City parks according to the usage of the property. Sports fields and golf courses are fertilized to provide an optimal surface for sports activities and to compensate for the physical wear to the grass cover. A pre-emergent herbicide is used on these properties to minimize species that can require more frequent mowing. Pesticides are only used on city parks, golf courses, and sports fields if a persistent pest problem occurs. Usage is limited to the affected area only. The Parks Department does not use any pesticides that are registered with the Missouri Department of Agriculture as Restricted-Use Pesticides. Several Parks Department personnel have also completed the Show-Me Yards & Neighborhoods Lawn Care Professionals Certification Program.

Further study would be needed to determine the feasibility of using alternatives to PHFs to effectively serve the purposes of minimizing maintenance activities and providing optimal conditions for the community's sports activities.

As reported in year three, the Parks Dept. has begun the process to certify Rivercut Golf Course through the Audubon Cooperative Sanctuary Program for Golf Courses. One of the components of this certification is Chemical Use Reduction and Safety, which includes specific requirements for implementing Integrated Pest Management (IPM) and other techniques for reducing the use of PHF's. Along with these certification efforts, staff has begun to evaluate municipal parks for implementation of sustainable management practices including IPM, use of native vegetation, no mow zones, and others.

Permit Reapplication: This activity will be continued as proposed in Appendix D.

5.7 - Illicit Discharges and Improper Disposal

Activity: 7.a — The City will develop standard procedures for investigation of reports of illicit discharges and for enforcement to prevent such discharges.

The Storm Water Services Division conducts investigation of illicit discharges and enforcement to prevent such discharges. Investigation is conducted in cooperation with the City's Sanitary Services Division or the Missouri Department of Natural Resources when necessary. The assistance of the Emergency Spill Response Team of the Springfield Fire Department is also utilized when necessary for hazardous materials spill response. The standard procedures reported in the annual reports for years two and three continue to be used.

Permit Reapplication: This activity will be continued as proposed in Appendix D.

Activity: 7.b - Development and implementation of a Field Screening Program.

The Field Screening Program at in-system locations and the Representative Monitoring Program at in-stream locations comprise a two-fold approach for monitoring the MS4. The Representative Monitoring Program is discussed in Section 6.3 of this report. The Field Screening Program is comprised of the following dry-weather and wet-weather screening components:

- **Dry-weather screening** serves to identify illicit discharges to the MS4. If flows are present at screening locations during dry weather, field kits are used to test for chlorine, copper, phenol, and detergents. Further investigation is done to isolate the source of the discharge and, according to the field-testing results, to isolate the source of the pollutant. Screening is required at a minimum of 50 locations each permit year.
- Wet-weather screening serves to quantify the quality of storm water from industrial areas to the MS4. Storm water runoff is sampled at screening points that drain industrial areas. The samples are analyzed at the City's Wastewater Laboratory at the Southwest Wastewater Treatment Plant. Sampling at 25 points each year is required.

Program Status - Dry-Weather Screening

Dry-weather screening was completed at 52 points in year four. A list and maps of the over 250 screening locations, showing the screening status of each location, are included in Appendix A. Of the 52 points screened, four had flow. Table 3 shows the field-testing results for the discharges at these points. The flows at sites 150 and 152 were found to be coming from springs. The flow at site 174 was investigated and could be coming from a water line leak. The flow at site 191 was from watering garden plants on a retail parking lot.

Table 3 – Dry-Weather Screening Results

Site #	Date	Temp (°F)	pН	DO (mg/l)	Conductivity (us)	Settleable Solids (mg/l)
150	6/15/06	70	6.26	7.1	450	0
152	6/15/06	73	7.8	8.39	389	0
174	6/14/06	22	7.51	5.5	287	0
191	6/14/06	Not Tested	i			

Program Status – Wet-Weather Screening

Wet-weather screening was completed at 25 points in year four. The sampling results are shown in Table 4. A few of the sample results show elevated levels of TSS and/or metals; however, overall the results do not indicate potentially significant pollutant sources that warrant further investigation.

Table 4 - Wet-Weather Field Screening Results

																	-		
Site #	Date	рН	BOD	СОБ	TSS	TDS	Y + Z	TKN	DP	ТР	0&G	Fecal	CaCO3	CR	CU	PB	N	AG	NZ
150	8/15/05	7.09	18	49	34	40	0.49	3.27	0.03	0.33	<10	23350	130	<10	14.7	<20	<10	<5	9.09
186	8/12/05	7.08	18	20	8	<20	0.78	2.6	0.08	0.3	<10	203000	98	<10	11.6	<20	<10	<5	34
133	8/15/05	6.5	20	106	32	20	0.54	2	0.15	0.44	<10	14000	91	<10	21.2	22.3	<10	<5	148
41	10/31/05	7.5	15	18	292	120	1.99	0.42	0.24	99'0	<10	11900	76	13.4	14.2	39.8	<10	<5	166
45	10/31/05	6.53	12	10	10	<20	0.44	<0.01	0.19	0.48	<10	4900	22	<10	<5	<20	<10	<5	15.6
72	10/31/05	5.12	12	12	34	<20	0.42	<0.01	0.08	0.41	<10	11400	43	<10	6.94	<20	<10	<5	56.5
64	10/31/05	5.62	17	19	96	40	0.65	0.02	0.18	0.42	<10	0096	09	<10	7.68	<20	<10	<5	46.9
151	10/31/05	5.54	15	12	54	40	0.39	<0.01	0.11	0.35	<10	3500	45	<10	5.02	<20	<10	<5	17.8
214	10/31/05	5.0	28	17	09	80	1.97	<0.01	0.12	0.39	<10	7500	74	<10	13.6	51.8	<10	<5	305
131	10/31/05	5.9	15	12	140	80	0.56	0.2	0.22	0.52	<10	0009	149	<10	6.83	<20	<10	<5	35.1
149	10/31/05	5.34	14	19	18	09	0.61	0.12	0.26	0.49	<10	2600	39	<10	5.59	<20	<10	<5	18.9
120	10/31/05	7.35	15	7	24	50	0.5	0.35	0.04	<0.01	<10	1280	30	14.5	<5	<20	<10	<5	<5
31	90/6/8	7.6	<2	11	<1	160	0.33	0.29	0.02	0.19	4	10	96	<10	7.44	<20	<10	<5	28.2
69	90/6/8	6.82	12	47	8	160	9	1.5	0.08	0.28	<1	170	120	<10	<5	<20	<10	<5	25.5
114	90/6/8	7.26	10	56	20	140	3.26	0.62	0.21	0.34	<1	10	116	<10	<5	<20	<10	<5	30.8
62	90/6/8	7.03	10	37	106	220	0.39	0.95	0.12	0.32	2	420	50	<10	<5	<20	<10	<5	40.1
152	90/6/8	7.19	4	26	62	240	0.45	0.79	0.07	0.37	2	430	84	<10	<5	<20	<10	<5	37.7
147	90/6/8	7.07	4	41	9	180	0.36	98.0	0.12	98'0	4	<10	54	<10	<5	<20	<10	<5	35.2
109	3/9/06	7.45	1	16	<1	180	0.11	0.11	0.03	0.24	<1	440	123	<10	<5	<20	15.2	<5	47.3
137	3/9/06	7.21	10	78	92	200	0.5	1.62	0.1	0.43	2	340	77	<10	22.1	<20	<10	<5	144
169	90/6/8	7.62	4	53	76	140	0.82	0.82	0.04	0.3	2	200	86	<10	19.7	<20	<10	<5	167
168	90/55/9	6.97	18	22	30	200	0.71	<0.05	0.15	0.24	<10	8100	26	<10	14.3	<20	<10	<5	51.5
143	90/55/9	6.42	19	99	46	260	0.57	13.1	0.1	0.17	<10	4300	20	<10	19.4	<20	<10	<5	113
224	90/55/9	7.24	19	26	36	240	0.71	<0.05	0.18	0.22	<10	23600	99	<10	13.5	<20	<10	<5	42.5
136	90/27/9	7.14	23	47	8	200	0.41	<0.05	0.3	0.33	<10	14600	40	<10	14.5	<20	<10	<5	44
Paramet Paramet TKN = T PB = Le	Parameters are measured in mg/l, except metals are ug/l, and fecal coliform is colonies/100 ml. Parameter Abbreviations: BOD = Biochemical Oxygen Demand; COD = Chemical Oxygen Demand; TSS = Total Suspended Solids; TDS TKN = Total Kjeldahl Nitrogen; DP = Dissolved Phosphorus; TP = Total Phosphorus; O&G = Oil & Grease; Fecal = Fecal Coliform; CaCO3 PB = Lead; NI = Nickel; AG = Silver; ZN = Zinc	red in mg ns: BOD itrogen; l; AG = S	g/l, excep = Bioche DP = Distilver; ZN	it metals i imical Oxy solved Phi = Zinc	are ug/l, ⁄gen Den osphorus	and fecal nand; COI ; TP = To	l, and fecal coliform is colonies/100 ml. emand; COD = Chemical Oxygen Dema us; TP = Total Phosphorus; O&G = Oil 8	colonies/ cal Oxyger orus; O&G	100 ml. n Demanc ; = Oil & (1; TSS = 1 3rease; Fe	Fotal Susp ecal = Fec	00 ml. Demand; TSS = Total Suspended Solids; TDS : = Oil & Grease; Fecal = Fecal Coliform; CaCO3	ls; TDS = ⁻ : CaCO3 =	Total Diss Hardness	= Total Dissolved Solids; N+N = Nitrate + Nitrite; = Hardness; CR = Chromium; CU = Copper;	olids; N+I Chromium	N = Nitra n; CU = (ite + Nitr Sopper;	ite;
				i															

Permit Reapplication: The dry-weather field screening activity will be continued as proposed in Appendix D. The wet-weather screening activity will be continued as proposed in Appendix D, Activity 8.d.

Activity: 7.c. (1) The permittee shall develop and implement standard procedures to investigate portions of the MS4 when illicit discharges are discovered or reported.

Standard procedures for investigation of the MS4 when illicit discharges are discovered or reported were implemented in year three and continued in year four. Storm Water Services investigated a total of 21 illicit discharges and storm water pollution reports during year four as listed in Table 5. A program to educate the public to report illicit discharges continues to be implemented as summarized in Activity 7.e.



Figure 13 – Motor oil dumped in a storm drain

Permit Reapplication: This activity will be continued as proposed in Appendix D, Activity 7.a.

Activity: 7.c. (2) The permittee shall develop and follow legally sound procedures in pursuing investigations on non-storm water discharges, such as guidelines for entry, investigations of private property, notification protocols, and documentation.

City Code Sections 96-31 through 96-36 provide legal authority and procedures for entry and investigations of private property, notification protocols, and documentation.

Permit Reapplication: This activity will be continued as proposed in Appendix D, Activity 7.a.

Activity: 7.d - Continue operation of the Emergency Spill Response Team.

The Fire Department's Hazardous Materials Response Team responds to spills in accordance with the *Hazardous Materials & Chemical Emergency Response Plan* adopted by the City of Springfield in October of 1987. A copy of the plan is on file with the City Clerk. The Hazardous Materials Response Team is utilized as necessary to assist in spill containment and neutralization when spills occur that may discharge to the MS4.

Permit Reapplication: This activity will be continued as proposed in Appendix D, Activity 7.c.

Table 5 - Illicit Discharge/Storm Water Pollution Report Investigations

	lable 5 - Illicit Discharge/Storr	lable 5 – Illicit Discharge/Storm Water Pollution Report Investigations
Date	Description	Investigation Result
7/11/05	Motor oil deposited in street	Sent informational letter to resident to maintain vehicles and properly dispose of oil
8/15/05	Wash water discharged	Industry to pump out wash water rather than discharging
9/2/05	Report of motor oil discharged to street	Sent informational letter to resident to properly dispose of oil
6/9/05	Trash/furniture dumping in drainage channel	Sent informational letters to surrounding residents to report dumping
10/13/05	Indoor sink and drinking fountains plumbed to storm system	Re-plumbed connections to sanitary sewer
10/14/05	Discharge of grease to creek channel	Notified restaurants not to discharge water from hosing mats, etc. outside
10/21/05	Paint tools being washed into storm drain	Notified to use indoor sink for washing
2/2/06	Discharge of wash water from commercial vehicle washing	Notified to use indoor wash bay, commercial car wash, or containment system
5/6/06	Discharge of wash water from concrete truck washing to drainage	Notified to use indoor wash bay, commercial car wash or containment system
2/7/06	Discharge of wash water from power washing to remove exterior paint	Notified to use containment system to dispose water to sanitary sewer
2/22/06	Motor oil dumped in storm drain	Responsible entity unknown; Storm drain cleaned out
90/8/8	Report of white, bubbly substance in ditch	No substance observed; provided contact info to report if reappears
3/27/06	Spill of liquid animal fat	On-site retention and ditch excavated and re-stabilized; Spillage pumped out of storm system
4/3/06	Pet waste being dumped in drainage channel	Sent notification of city ordinance prohibiting disposal of pet waste to MS4
4/4/06	Sewage discharged to street by basement sump pump from residential overflow	Sewer lateral blockage corrected
4/10/06	Sewage discharged to street/storm drain from broken private laterals	Laterals repaired
4/17/06	Sewage discharged to storm box from exposed lateral	Lateral exposure capped
4/25/06	Report of oil discharge of wash water containing chemicals	Notified to use indoor wash bay, commercial car wash, or containment system
90/2/9	Discharge of wash water from commercial vehicle washing	Notified to use indoor wash bay, commercial car wash, or containment system. Issued Notice of Violation due to repeat offense.
6/12/06	Discharge of wash water from commercial vehicle washing	Notified to use indoor wash bay, commercial car wash, or containment system
6/14/06	Dry-weather discharge in storm drain	Traced to industry who contained discharge until identified as water line leak and repaired

Activity: 7.e — Develop and implement a program that informs the public on how to report spills, illegal dumping, illicit connections and water quality problems. The program shall provide the public information as to what to look for and how to report incidents.

The City has utilized a variety of means to inform the public on reporting illicit discharges/storm water pollution. The *Quality Ozark Streams* flyer included in City Utilities bills distributed to approximately 98,000 customers annually since 2002 details what to look for and how to report illicit discharges and pollution problems. This information is also included in the pollution prevention brochures and on a magnet distributed at education and outreach opportunities summarized in Section 5.10. Additionally, in year four this information was included in the 2006 Community Guide published and distributed by the Springfield Chamber of Commerce and 417 Magazine.

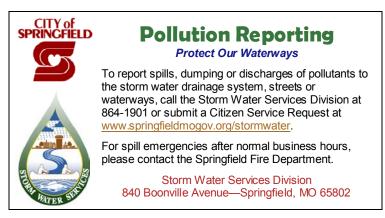


Figure 14 - Pollution reporting magnet

Permit Reapplication: This activity will be continued as proposed in Appendix D, Activity 7.d.

Activity: 7.f - Continue program that informs the public on proper management and disposal of used oil and toxic materials.

The Solid Waste Management and Storm Water Services Divisions of Public Works provide public education on the proper management and disposal of used oil and toxic materials.

- The City's Household Chemical Collection Center (HCCC) is available to Springfield and Greene County residents for proper disposal of unneeded household chemicals, including automotive products. The Solid Waste Management Division produces and distributes a brochure that provides information about visiting the HCCC and guidelines on proper storage and handling of household chemicals. This information is also available on the Division's web page at www.springfieldmogov.org/recycling. The HCCC is also highlighted on the *Quality Ozark Streams* flyer included in City Utilities bills distributed to approximately 98,000 customers annually since 2002. This flyer is included in Appendix C. As summarized in the Calendar of Activities in Section 5.10, information about the HCCC was also provided at education and outreach opportunities, and tours of the facility were given to school classes and other interested groups. In 2005-2006, 2,477 appointments were made to use the HCCC, resulting in 79,930 lbs. of household materials being collected. Of this total, 85% or 68,220 lbs. were recycled. A total of 1,070,611 lbs of materials have been collected since the HCCC opened in 1994. A breakdown of materials collected is included in Appendix B.
- The Solid Waste Management Division publishes a *Guide to Recycling in Springfield* that includes a list of local retailers that accept used oil. This guide is distributed as a brochure and is also available on the Division's web page at www.springfieldmogov.org/recycling.
- The City cosponsored two electronic waste collection events during year four. During the America Recycles Day event in November 2005, 6.1 tons of e-waste was collected. During the Earth Day event in April 2006, 1.2 tons was

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collected. Over 95% of this waste will be recycled at the Computer Recycling Center, a privately owned facility in Springfield.

Permit Reapplication: This activity will be continued as proposed in Appendix D, Activity 7.e.

Activity: 7.g - Implement program to reduce or eliminate to the extent practicable the inflow, infiltration and discharge of sanitary sewage into the MS4.

A primary objective of the City's Infiltration and Inflow (I/I) Program is to reduce to the maximum extent practicable the occurrence of sanitary sewer overflows (SSOs) into the MS4. A Sewer System Evaluation Survey (SSES) was completed system-wide in June 2003. The SSES was conducted to identify possible sources of I/I. The correlation of measurements from rainfall and flow monitoring using flow meters placed at varying locations throughout the sanitary sewer system was studied to indicate the extent of I/I. Several methods were then used to identify the specific sources of I/I. These methods include visual inspection to locate faults in manhole covers and accessible pipes, TV inspection to assess internal pipe conditions, and dye and smoke testing to locate and confirm faulty sewer pipes that may not be readily visible.

Once specific sources of I/I are identified, rehabilitation is performed using manhole wall spraying, in-place pipe

relining, and manhole frame and lid replacement. Currently, rehabilitation of the system is done by contractors and inspected by 2 full-time personnel. During 2005-2006, 12,020 lineal feet of sanitary sewer lines and 182 manholes were rehabilitated. Since 1996, 76,579 lineal feet and 12,765 manholes have been rehabilitated, resulting in over

During 2005-2006, 12,020 lineal feet of sanitary sewer lines and 182 manholes were rehabilitated.

83.69 million gallons per day reduction of wet-weather flows. Wet-weather SSOs have significantly decreased in both frequency and duration. Treatment plant flows during wet-weather conditions have experienced similar decreases in both frequency and duration of peak flow events. Ten percent of sanitary sewer revenues are earmarked to finance ongoing I/I programs. Since 1995, the City has committed over \$16 million to fund the I/I program.

Following the completion of the SSES, it has been determined that the wastewater utility should continue the I/I Program as an ongoing effort to look for opportunities to efficiently and economically reduce SSOs and I/I impacts on the wastewater infrastructure. Virtually all I/I and SSO reduction has been accomplished on the public side of the wastewater infrastructure. Studies by the wastewater utility have shown that at least 50% of the source and intrusion of wet-weather flows into the sanitary sewer system are derived from private sources, i.e. broken or leaky building sewers, leaky basements, and illegal connections of footing drains, roof drains, sump pumps, area drains, etc. Because these sources are on private property they cannot be corrected unilaterally by the wastewater utility. A funding mechanism and public acceptance of a private I/I reduction program is needed to effectively address the SSO problem. In 2005-2006, a subcommittee of the Environmental Advisory Board was formed to study the private side I/I issue. The subcommittee report presented in June 2006 recommended a phased approach that will initially address uncapped cleanouts and roof downspout connections, estimated to account for approximately 58% of the total I/I from all identified private property sources of I/I. Efforts will be made to address other types of defects following this initial phase. This program is anticipated to begin in 2007.

Permit Reapplication: This activity will be continued as proposed in Appendix D, Activity 7.f.

5.8 - Monitor and Control Pollutants from Industrial and High Risk Runoff

Activity: 8.a – The city will develop a program to identify the following industries that discharge to the MS4:

- 1. Municipal landfills
- 2. Hazardous waste treatment, storage and disposal facilities
- 3. Industries subject to reporting requirements pursuant to SARA Title III Section 313; and
- 4. Industrial facilities that the city determines are contributing a substantial loading of pollutants to the MS4.

The City has identified the industry categories listed above.

- 1. There are no active municipal landfills within the City limits.
- 2. The following list of hazardous waste treatment, storage and disposal (TSD) facilities was obtained from the Missouri Department of Natural Resources website (www.dnr.mo.gov/).
 - Clariant LSM Inc. 2460 W. Bennett St.
 - ▶ Kerr-McGee 2800 W. High St.
 - ▶ Safety-Kleen 734 N. West Bypass
 - ▶ VOPAK USA Inc. 505 E Trafficway
 - ▶ Zenith Electronics Corp. (Tracker Marine) 2500 E. Kearney St.
- 3. Information on industries subject to reporting requirements pursuant to SARA Title III Section 313 was obtained from the <u>State of Missouri Toxics Release Inventory Summary Report: 2003 Data</u> (MDNR 2005). The 2003 Toxics Release Inventory (TRI) report is the most recent data available on the MDNR website at the time of this report. The appendix pages from this report containing a listing of reporting facilities for Springfield were included in the 2004-2005 annual report.
- 4. No facilities were identified as contributing a substantial loading of pollutants to the MS4 through the field screening program, public reporting, or other information in year four.

Permit Reapplication: This activity will continue as proposed in Appendix D.

Activity: 8.b - Develop a self-monitoring program for facilities identified in 8.a above. This monitoring program will include the collection of quantitative data on any pollutants limited in an existing NPDES permit for an identified facility.

In year three, 24 of the 25 facilities identified were inspected as reported in the third annual report. In July 2006, the remaining facility out of the 25 was inspected as well as one additional facility. This facility was not listed in the 2002 TRI report, which was used to develop the facility listing in year three, but is listed in the 2003 report. Both of these facilities have an NPDES permit. The inspections resulted in a recommendation being made to one of the facilities to address a minor issue with outdoor materials storage.

Permit Reapplication: This activity will continue as proposed in Appendix D, Activities 8.b-e.

5.9 - Construction Site Runoff

Activity: 9.a - Continue current erosion and sediment control regulations for land disturbance activities for areas less than five acres.

City Code Chapter 96 requires erosion and sediment controls for land disturbance activities. All site development plans are reviewed by both Building Development Services and Storm Water Services. All plans receive a stamp indicating that erosion and sediment control measures must be followed. Site inspections are conducted by Building Development Services. Development plans for subdivisions, which are reviewed by Storm Water Services, must also include measures for erosion and sediment control. Public Works conducts site inspections of subdivisions.

Public Works maintains a MOR100 land disturbance permit issued by MDNR for all Public Works construction projects with land disturbance of 1 acre or more as required. The City submits a quarterly activity report to MDNR detailing the status of land disturbance sites.

Permit Reapplication: This activity will continue under Appendix D, Activity 9.a, with the addition of Activities 9.b,c, and e.

Activity: 9.b - Continue to require land disturbance permits from the MDNR for sites of five or more acres.

During the first permit year, in compliance with new MDNR regulations, the City expanded the requirement for a land disturbance permit from MDNR to include sites of one or more acres. Additionally, a procedure was implemented requiring developers to show that they have obtained the necessary permit from MDNR before the City will issue a building permit.

Permit Reapplication: This activity will continue under Appendix D, Activity 9.a.

Activity: 9.c - Provide information for education of construction site operators.

New designers or those unfamiliar with the City's policies are provided an informational packet that includes a copy of the *Erosion and Sediment Control Guidelines*. These guidelines are also available on the City's website at www.springfieldmogov.org/stormwater/stormwater docs. Review and inspection staff members work to educate site designers and construction site operators when possible.

Permit Reapplication: This activity will continue under Appendix D, Activity 9.d.

5.10 - Comprehensive Public Education/Outreach and Involvement Program

Storm water education and public outreach activities include displays and presentations at community events, media and publications opportunities, and presentations and workshops for area audiences. Storm water/water quality issues are the primary focus of many education and public outreach activities while also being included as a closely related topic in the educational activities of the Solid Waste Management Division. This combined educational focus highlights the dual benefits for solid waste management and storm water quality of such programs as the Household Chemical Collection Center (HCCC) and the Yardwaste Recycling Center (YRC). Education/outreach tools and programs as well as a calendar of activities during year four are provided below. The City also provides funding support to the Watershed Committee of the Ozarks and James River Basin Partnership. These local organizations provide public education and outreach on storm water/water quality issues.

2005-2006 Education/Outreach Programs and Projects:



Adopt-A-Stream

The City launched an Adopt-A-Stream program in May 2005. This program was modeled after the City's Adopt-A-Street program that began in 1989 and has grown to include over 170 organizations volunteering to keep more than 117 miles of city roadways clean. While Adopt-A-Street helps keep trash out of area waterways by cleaning up city streets, Adopt-A-Stream creates opportunities for volunteers to help by cleaning up when trash and other items do end up in these waterways. Volunteers adopt at least a 0.5 miles section of stream for a one-year commitment and conduct at least 3 cleanups of the section during that year. The City provides trash bags and collection of the bags as well as recognition of the volunteers on signs installed at the stream section and on the city website at www.springfieldmogov.org/stormwater.

Public response to the program has been enthusiastic. When the program was launched, an adoption list was developed of stream sections on city-owned property. These 15 sections as well as one privately owned section

were adopted in the first year, totaling 10 miles of adopted streams. The program participants collected 269 bags of trash, estimated at 30 cubic yards, as well as tires and other items. An article about the program is featured in the *Choose Environmental Excellence* newsletter included in Appendix C.

Adopt-A-Stream program participants collected 269 bags of trash, estimated at 30 cubic yards, as well as tire and other items during the program's first year.

Storm Drain Marking

The City continued to partner with James River Basin Partnership (JRBP) on storm drain marking projects in 2005-2006. Girl Scouts and Boys & Girls Town youth marked 65 drains around the city with the markers shown in Figure 29. These volunteers also distributed door hangers (see Appendix C) that provide storm water pollution prevention information to residents.

Quality Ozark Streams utility bill insert

An educational flyer titled *Quality Ozark Streams* has been included annually since 2002 in City Utilities bills distributed to approximately 98,000 customers. The flyer includes information on the City's NPDES Permit, along with examples of how the public can help prevent storm water pollution. These examples include proper disposal of yardwaste and household chemicals,



Figure 15 - Storm drain marker customized for the James River watershed

reporting illicit discharges, soil testing to prevent over-fertilization, and others. The flyer is included in Appendix C.

TV23 Programming

TV23, the City's Municipal Government cable channel, began airing two programs focusing on water quality in October 2004. *After the Storm*, co-produced by EPA and The Weather Channel, includes three case studies focusing on storm water pollution. *Keeping Our Waters Clean*, produced by MDNR, provides an easy-to-understand look at non-point source pollution and the TMDL program. The two programs continued to air weekly on TV23 in July-October 2005. Also in year four, TV23 began producing a series of monthly segments titled "Yard Rx" based on the SMY&N principles. This series is detailed under Activity 6.a.

♦ Environmental/Conservation Education Summit

In August 2005, Springfield/Greene County *Choose Environmental Excellence* held the first ever Environmental/Conservation Education Summit. Representatives from 28 area organizations, universities, and government agencies attended the summit, each providing a wish list of projects or activities they would like to see implemented. Participants brainstormed, prioritized, and strategized on these wish list items with the goal of fostering collaborative partnerships to address identified needs. Projects and activities to improve water quality were identified as a priority. A directory of organizations that provide environmental/conservation programs and services was also developed as a result of the summit. The proceedings and directory are available at www.springfieldmogov.org/cee and <a href="https://www.spri

OzarksEnvironment.com

This website resulted from the list of needs developed during the Environmental/Conservation Education Summit hosted by Springfield-Greene County *Choose Environmental Excellence* in August 2005. The purpose of the website is to provide one location for listing environmental events, volunteer opportunities, news, and agency/organization information. The website was designed by the Discovery Center of Springfield and is hosted and maintained by the City.

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Pet Waste Disposal Stations

The Parks Department continues to provide bag dispensers and receptacles for pickup and disposal of dog waste at several city parks. An article by the Springfield News-Leader about proper pet waste disposal is included in Appendix C.

Education/Outreach Tools, Resources and Publications:



Websites

The City maintains the following websites that provide information related to components of the City's Storm Water Management Program:

- www.springfieldmogov.org/stormwater Storm Water Services Division of Public Works
- www.springfieldmogov.org/recycling Solid Waste Management Division of Public Works
- www.springfieldmogov.org/showmeyards Show-Me Yards & Neighborhoods Program
- <u>www.springfieldmogov.org/cee</u> Springfield-Greene County Choose Environmental Excellence
- www.ozarksenvironment.com Environmental events, volunteer opportunities, news, and agency/organization information
- Resource Guides City resources and programs are listed in the following publications, which are available at www.springfieldmogov.org/cee and www.ozarksenvironment.com:
 - Springfield Area Directory of Environmental Agencies and Organizations A listing of government, non-profit, and member-based agencies and organizations, published by Springfield/Greene County Choose Environmental Excellence.
 - Community Resource Guide A guide to community resources available for field education and hands-on learning, compiled by the Interpreters Coalition of Greene County.
 - Directory of Programs in Environmental/Conservation Education A listing of government, non-profit, and member-based agencies and organization, published by Springfield/Greene County Choose Environmental Excellence.

Water Quality for Life Kiosk and Water Quality Bags

The Water Quality for Life interactive kiosk features an interactive map of local watersheds containing information about unique natural resources and watershed issues, a karst game that takes players through a virtual cave by way of karst and water-related problem solving, and a list of water-related publications donated by the Watershed Committee of the Ozarks to the Springfield-Greene County Library District. This traveling kiosk has been stationed at the Library Center and Library Station as well as at special events. Created with funds from an EPA grant, it is one of the first educational tools produced through the Watershed Committee's Watershed Center Project. Also included in this project were the donation of over 100 water-related publications to the Library and the development of Water Quality Bags available for checkout from the Library containing books and videos about responsible water stewardship targeting elementary and middle school students.

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Our Watershed Exhibit

An exhibit titled *Our Watershed* provides interactive learning about non-point source pollution at the Discovery Center of Springfield. The exhibit contains a variety of information on storm water runoff, septic tanks, karst topography, and land uses as related to watershed issues. The exhibit, which was coordinated by the Watershed Committee of the Ozarks, received grant funding from the Missouri Department of Natural Resources with additional funding from the Solid Waste Management and Sanitary Services Divisions of Public Works, and Silver Dollar City.

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Environmental Report Card

The Environmental Report Card is an effort to monitor environmental indicators over time in Greene County and provide a report of these indicators to the public. These indicators include measurements of water quality and quantity, community health, solid waste/recycling, air quality, and population. The 2006 Environmental Report Card features these indicators as well as a new calendar format that provides monthly tips on preserving the

environment. The 2006 report was produced by the Springfield-Greene County Health Department and City Utilities.



Calendar of Activities

July 2005

- Provided storm water educational materials for display at Ozark Empire Fair
- City Council luncheon tour of Jordan Creek North Branch stream daylighting project

August 2005

- Choose Environmental Excellence Environmental/Conservation Education Summit
- Free Wheelin' Friday Provided information about field trips to HCCC and recycling centers
- Provided resource guides containing recycling/storm water information to new R-12 science teachers
- Presentation on recycling/HCCC to MSU Earth Science for Teachers class
- Provided informational materials to Drury University science class on recycling/HCCC
- Presentation on storm water management program to City Council

September 2005

- Presentation on storm water issues to Missouri State University class
- Presentation on storm water/solid waste to Municipal Government Academy class
- Presentation to Greenwood 4th grade on recycling/HCCC

October 2005

- KOLR 10 TV news spot on storm drain marking partnership efforts by City and James River Basin Partnership, featuring Boys & Girls Town of Missouri youth
- Article in Springfield News-leader about Adopt-A-Stream program
- Display/information on recycling/HCCC at MSU "Expand Your Horizons" event
- Workshop with MSU geography/geology professors on local water quality issues/projects
- Presentation on recycling/HCCC, and Springfield Sanitary Landfill tour, including storm water management for Drury University class
- Published "Fall Checklist" (See Appendix C)
- Presentation on recycling/HCCC, to Evangel College Honor Society
- Recycling/HCCC display with storm water information at Springfield Business Expo
- Workshop with community teaching professionals on Watershed Center education program plan
- Presentation on recycling/HCCC to Sertoma Club

November 2005

- Groundbreaking ceremony for Lakeside Learning Station at Watershed Center Valley Water Mill site
- Springfield Sanitary Landfill tour, including storm water management, for MSU class
- KOLR 10, KY3, and Channel 33 TV News spots on proper yardwaste disposal
- KSMU radio spot on America Recycles Day e-waste collection event

January 2006

- Storm water display and educational materials at Construction Specifications Institute Southwest Missouri Chapter Trade & Product Show
- Quality Ozark Streams flyer in City Utilities customer bills
- Display on recycling/storm water with MSU at Robberson Elementary science fair
- ▶ Presentation on recycling/HCCC to MSU Earth Science for Teachers class
- Vision 20/20 Water Quality Funding Group recommendation presentations to Chamber of Commerce and community

February 2006

- Workshop presenting draft Storm Water Drainage Criteria Manual to review teams composed of local engineers and citizens
- Display and educational materials on storm water, SMY&N, HCCC, and other recycling information at the Springfield Home Show at the Springfield Exposition Center
- Water education activity provided for students in Portland Elementary after-school program
- Display and educational materials on storm water, SMY&N, HCCC, and recycling as well as SMY&N workshop at the Lawn & Garden Show at the Missouri Entertainment & Events Center
- Article by Springfield News-Leader about Discovery Center project (see Section 3.0 and Appendix B)

March 2006

- Presentation on storm water/solid waste for Municipal Government Academy class
- Presentation on storm water issues focusing on land use change and impervious area to MSU Environmental Assessment class
- Presentation on "Environmentally Sound Gardening" featuring SMY&N principles at the Naturescaping Symposium at the Springfield Conservation Nature Center
- ▶ Groundbreaking for Habitat for Humanity Legacy Trails low-impact development
- Presentation and HCCC tour for Students Go To Work class
- SMY&N display at Wonders of Wildlife event
- Presentation on water quality issues to Master Naturalist class, including information packets with Adopt-A-Stream and storm water educational materials
- Articles in Springfield News-Leader about Little Sac TMDL and HFH LID subdivision (see Section 3.0 and Appendix B)

April 2006

- Earth Day observance included a month of hands-on work projects and educational opportunities and a citywide celebration on Saturday, April 22. (See Appendix C)
- Earth Day issue of the *Choose Environmental Excellence* newsletter published, featuring Adopt-A-Stream, the Habitat for Humanity low-impact development subdivision, and other water quality topics. (See Appendix C)
- Presentation on City's Storm Water Management Program at Watershed Committee of the Ozarks monthly meeting
- Presentation on City's Illicit Discharge Detection & Elimination program at International Erosion Control Association Great Rivers Chapter Spring Conference workshop titled "Implementing an NPDES Phase II Program" in West Plains, MO.
- Sponsored Master Naturalist class field trip to Valley Water Mill Watershed Center site
- Presentation on recycling/HCCC at MSU recycling event
- Tour of Springfield Sanitary Landfill including storm water management

May 2006

- Presentation on recycling/HCCC to Drury University class
- ▶ Tour of HCCC for Bailey School
- Presentation on HCCC at Ozark Safety Fair
- Tour of HCCC and Springfield Sanitary Landfill for MSU class
- Presentation on recycling/HCCC/water quality to local church environmental stewardship committee
- Recycling/HCCC display at WOW Outdoor Day

June 2006

- Presentation on City's Illicit Discharge Detection & Elimination program at Missouri Department of Natural Resources workshop titled "Implementing an NPDES Phase II Program" in Jefferson City, MO.
- Storm water display and educational materials at River Rescue event held by James River Basin Partnership
- ▶ HCCC display at Safety Expo
- HCCC and Springfield Sanitary Landfill tour with Stockton school class

6.0 Monitoring Section

6.1 - Inventory of Known Major Outfalls

Major outfalls were identified based on the following definitions from 10 CSR 20-6:

- "Outfall. A point source as defined by 10 CSR 20-2.010 at the point where a municipal separate storm sewer discharges and does not include open conveyances connecting two (2) municipal separate storm sewers, pipes, tunnels or other conveyances which connect segments of waters of the state and are used to convey waters of the state."
- "Major municipal separate storm sewer system outfall (major outfall). A municipal separate storm sewer outfall that discharges from a single pipe with an inside diameter of thirty-six inches (36") or more (or its equivalent) or for municipal separate storm sewers that receive storm waters from lands zoned for industrial activity within the municipal separate storm sewer system with an outfall that discharges from a single pipe with an inside diameter of twelve inches (12") or more (or from its equivalent). Industrial activity areas do not include commercial areas."

The equivalent of a single pipe with an inside diameter of thirty-six inches or more is further defined in 40 CFR Part 122.26 as "...discharge from a single conveyance other than circular pipe which is associated with a drainage area of more than 50 acres". The equivalent of a single pipe with an inside diameter of twelve inches or more is further defined as "...discharge from other than a circular pipe associated with a drainage area of 2 acres or more".

According to these definitions, the following types of discharge points were identified as major outfalls:

- A single pipe with an inside diameter of 36 inches or more (or a single conveyance that drains an area of more than 50 acres) that discharges at the municipal boundary or discharges into waters of the state.
- In areas zoned for industrial activity, a single pipe with an inside diameter of 12 inches or more (or a single conveyance that drains an area of 2 acres or more) that discharges at the municipal boundary or discharges into waters of the state.

Known major outfalls are listed in Appendix B. Additional major outfalls will be identified as mapping of the MS4 progresses.

6.2 - Estimate of Total Annual Volume of Urban Runoff Discharges

The total annual volume of urban runoff discharges for the City in year four is estimated to have been 10.7 billion gallons as shown in Table 6. The calculation is based on a total precipitation during year four of 35.12" according to the National Weather Service station at the Springfield/Branson National Airport. To calculate this

The total annual volume of urban runoff discharges for the City is estimated to have been 10.7 billion gallons for year four.

estimate, the individual precipitation events that occurred throughout the year were categorized by precipitation amount as shown in Table 6. The runoff volumes for categories 5 and 6 were calculated using the Runoff Curve Number method (Soil Conservation Service 1986). This method uses the following equation:

$$Q = \frac{(P - I_a)^2}{(P - I_a) + S}$$

where

Q = runoff (inches)

P = rainfall (inches)

S =potential maximum retention after runoff begins (inches)

 I_a = initial abstraction (inches)

and

$$I_a = 0.2S$$
$$S = \frac{1000}{CN} - 10$$

where

CN = curve number ranging from 0-100 that is determined by knowing the hydrologic soil group and land cover type

The CN is a weighted average of the CN for the impervious and pervious cover types according to the percentage of these types in the City limits. The percentage of impervious cover and the type and percentage of pervious cover were estimated through examination of aerial photographs of the City. The total discharge volume is determined by multiplying Q by the total area within the City limits. The following numbers were used in calculating the runoff volume for categories 5 and 6:

- % Impervious = 35
- Impervious CN = 98
- Pervious Cover = 65
- Pervious CN = 73
- City area = 50,696 acres

Using the SCS Curve Number method, the precipitation amount for categories 1-3 is not great enough to overcome the calculated infiltration loss, resulting in a runoff volume of zero. However, experience dictates that these small rainfall events do in fact create a substantial amount of runoff, which is largely due to the amount of directly connected impervious area within the watershed. Therefore, a more accurate estimate for these categories can be obtained by assuming that directly connected impervious area is the sole source of runoff from precipitation events in these categories. The area within the City limits is estimated to be 35% impervious. It is estimated that half of the impervious area, equaling 8,871 acres, is directly connected. The runoff volume for these categories is estimated by multiplying the precipitation amount by 8,871 acres. For category 4, the calculation of runoff using the SCS Curve Number method results in a volume less than the calculated volume for category 3. Therefore, the runoff volume for category 4 was calculated with the same method used for categories 1-3.

Table 6 – Total Annual Volume of Urban Runoff Discharges

		17	abie 6 – Totai <i>I</i>	Annual Volur	ne of Urban I	Kunoff Discha	rges
	recipitation	Average Precipitation	# of Events Per	Runoff Volur	me Per Event	Total Run	off Volume
Cate	gory (menes)	Precipitation	Category	Cubic Feet	Gallons	Cubic Feet	Gallons
#1	0 - 0.1	0.04	31	1,288,074	9,612,494	39,930,301	297,987,321
#2	0.11 - 0.2	0.15	15	4,830,278	36,046,853	72,454,175	540,702,800
#3	0.21 - 0.4	0.32	17	10,304,594	76,899,954	175,178,095	1,307,299,215
#4	0.41 - 0.8	0.51	10	16,422,946	122,559,301	164,229,464	1,225,593,014
#5	0.81 - 1.6	1.02	8	21,572,331	160,987,546	172,578,649	1,287,900,367
#6	>1.6	2.15	6	135,683,551	1,012,563,810	814,101,303	6,075,382,860
						1,438,471,988	10,734,865,579

6.3 - Monitoring Program Summary

6.3.1 Program Rationale

The Representative Monitoring Program and the Field Screening Program comprise a two-fold approach to monitoring the MS4. These programs establish a base line from which to monitor the effectiveness of the SWMP. The Field Screening Program, which serves to identify illicit discharges and quantify the quality of storm water from industrial areas to the MS4, is discussed in Section 5.6 of this report. The Representative Monitoring Program consists of the following sampling schedule:

- Ambient sampling representing the quality of the stream base flow, to be completed at each of the six in-stream locations during the second weeks of November, March, and May.
- Wet-weather sampling, representing the influence of storm water runoff on water quality, to be completed once at each of the six in-stream locations during the period of March 1 through May 31.

The Representative Monitoring Program represents a shift from in-system sampling and land-use based characterization to in-stream sampling with a regional perspective. In Part 1 of the original Permit application, six points were identified as being representative of either residential, commercial or industrial land uses in the City. The data collected and presented in Part 2 of the application indicates that pollutant levels in storm water from these land uses are generally below the Nationwide Urban Runoff Program (NURP) event mean concentrations for the respective land use types. It was proposed to use six in-stream locations representative of the City's entire watershed to better measure the effectiveness of the SWMP. These six in-stream locations are near the City limits and emphasize the cumulative effect of storm water runoff from the minor watersheds identified in Parts 1 and 2 of the Permit application. These locations are listed below and shown in Figure 16.

- 1. **South Creek at Golden.** This location drains mostly residential.
- 2. **Jordan Creek at Bennett.** This location drains the oldest and most industrialized portion of the City.
- 3. **Wilsons Creek at Farm Road 146.** This location drains approximately 40% of the City, including the oldest portion of the City.
- 4. **Galloway at Highway 60.** This location drains an area of the City representing all the land uses i.e. small to large residential lots, commercial, and manufacturing.
- 5. **Jones Spring.** This location drains a large sinkhole cluster area of the City.
- 6. **Pea Ridge at Farm Road 102.** This location drains the northern portion of the City and has Interstate-44 running through the drainage area.

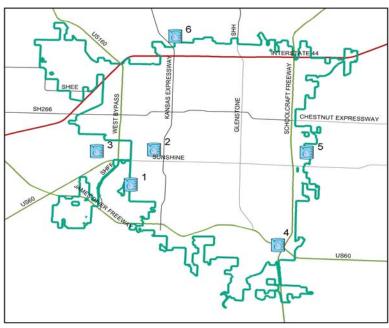


Figure 16 - Sampling sites for the Representative Monitoring Program

6.3.2 Storm Event Data

The storm event data for the wet-weather sampling event on May 22 is reported as specified under Part V.A.2 of the Permit. The storm event sampled occurred on May 21. According to data from the National Weather Service station at the Springfield-Branson Regional Airport, the event total rainfall was 0.9" occurring as two events approximately 15 hours apart. The first event was 0.07" occurring over a period of 4 hours. The second event was 0.83" occurring in 1 hour. The previous measurable (greater than 0.1") storm event occurred on May 10 with a total rainfall of 3.15" ending approximately 11 days before the sampled storm event. The total discharge volumes at each of the six sampling locations for the sampled storm event of May 21 were estimated using the SCS Runoff Curve Number method (Soil Conservation Service 1986) outlined in Section 6.2. It is not likely that the first event of 0.07" contributed sampled runoff so was not included in the discharge calculations. Runoff from directly connected areas and unconnected areas were calculated separately and summed to account for runoff from directly connected areas during small rain events. The impervious, pervious, and directly connected percentages were estimated based on aerial photography. The total discharge volumes are listed in Table 7 along with the calculation values used. The total discharge volume for Jones Spring was calculated by using a basin area of 48 contributing sinkholes and assuming that all water entering these sinkholes discharges at Jones Spring.

Table 7 – Discharge Volumes for Wet-Weather In-Stream Sampling Event

	1 abic 7	210011415	c volumes	101 1100		001000111	- String		
Outfall Location	Impervious %	Impervious CN	Pervious %	Pervious CN	Directly Connected %	Directly Con. CN	Basin Area (acres)	Discharge Volume (cubic feet)	Discharge Volume (gallons)
South Creek	25	98	75	75	11	98	3,305	1,118,163	8,364,978
Jordan Creek	30	98	70	75	20	98	8,780	4,560,033	34,113,604
Wilsons Creek	28	98	72	75	12	98	19,174	7,168,958	53,630,974
Galloway Creek	25	98	75	72	13	98	4,323	1,414,582	10,582,488
Jones Spring	23	98	77	76	10	98	1,832	605,570	4,530,267
Pea Ridge Creek	22	98	78	72	7	98	5,497	1,110,305	8,306,189

6.3.3 Monitoring Results and Discussion

Samples were analyzed at the City's Wastewater Laboratory at the Southwest Wastewater Treatment Plant. The results for the conventional parameters listed in Part V. of the Permit are shown in Table 8. The results for the metals listed in Part. V of the Permit are shown in Table 9. All of the results for pesticides, volatile organics (method 624 & 603), and acid/base neutral organics (method 625) listed in Part V. of the Permit were below the detection limits. One set of the lab analysis sheets showing the detection limits for these parameters is included in Appendix B. The lab analysis sheets for the individual sampling events were submitted separately to MDNR along with the results for the conventional parameters and metals.

The results were compared with the Missouri Water Quality Standards at 10 CSR 20-7.031. Jordan Creek, Pea Ridge Creek, Galloway Creek, Wilsons Creek, and South Creek are all classified as general warm-water fisheries with use designations for Livestock & Wildlife Watering and Protection of Warm Water Aquatic Life and Human Health – Fish Consumption. Pea Ridge Creek is additionally designated as a Drinking Water Supply. Jones Spring, which contributes surface water to the Jones Branch tributary of Pearson Creek is not specifically classified. Results were compared to the chronic criteria as specified in the water quality standards for Livestock & Wildlife Watering.

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Measurements of pH were taken in-stream at the time of sampling with an Oakton pH/DO meter. All of the pH measurements were within the range of 6.5-9.0 specified in the water quality standards with the exception of Jones Spring on May 22.

Oil & Grease

All of the sample analysis results for oil & grease met the water quality standard of 10mg/l.

BOD and COD

There are no water quality standards specifically for BOD or COD. The water quality standard for dissolved oxygen is a minimum of 5mg/l. Dissolved oxygen measurements taken in-stream at the time of sampling with an Oakton pH/DO meter for the November and March sampling events were above 5 mg/l. Readings could not be taken for the May sampling events due to the meter being repaired at that time.

TSS and TDS

There are no numeric criteria in the water quality standards for TSS or TDS. The water quality standards include a narrative standard for solids to protect the beneficial uses of the stream. The sampling results for TSS range from <1 – 9mg/l. TDS levels in streams can vary greatly depending on natural background levels. Significant increases in TDS beyond the normal range for a given stream can interfere with the beneficial uses of the stream. The TDS results are within the normal range of results seen over the past 4 years.

Nitrogen and Phosphorus

With the exception of Pea Ridge Creek, the sampled streams as well as Jones Spring are in the James River watershed. The James River Total Maximum Daily Load (TMDL) provides nutrient target recommendations of 0.075 mg/l for total phosphorus and 1.5 mg/l for total nitrogen for "...all classified streams and rivers that feed into impaired segments of the James River" (MDNR 2001). Total nitrogen is defined in the James River TMDL as kjeldahl nitrogen plus ammonia nitrogen. In the parameters listed in the Permit, total kjeldahl nitrogen (TKN) is equivalent to this definition of total nitrogen. All of the results for TKN for the sampling sites in the James River watershed meet the TMDL nutrient target recommendation for total nitrogen with the exception of South Creek on May 22. Individual sampling events for each of the sites in the James River watershed met the TMDL nutrient target recommendation for total phosphorus, though none of the sites did so consistently for all four of the sampling events. The results for total phosphorus in Pea Ridge Creek were similar to the results at the other sites.

Cyanide and Phenolics

The water quality standards for cyanide and phenol are 0.005mg/l and 0.1mg/l respectively. All of the results met these water quality standards.

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Fecal Coliform and Fecal Strep

The water quality standard of 200/100ml for fecal coliform only applies to waters designated for Whole Body Contact Recreation Category A. The classified streams sampled are designated for Whole Body Contact Recreation Category B.

Metals

All of the results for metals were below the detection limits shown in Table 10 except for some of the results for zinc. These results for zinc met the water quality standard that ranges from 59 - 233 ug/l (ppb) depending on the hardness value.

Permit Reapplication: The Representative Monitoring Program will continue as proposed in Appendix D.

6.3.4 Event Mean Concentrations and Seasonal Pollutant Loadings

In the annual reports for years four and five, Parts V.D.2.e. (1)(b) and V.A.4 of the Permit require estimates for each monitoring outfall of seasonal pollutant loadings and event mean concentrations (EMC) for a representative storm event for the parameters listed in Table V.A.1.a (1) in the Permit. These estimates are given in Table 10. Estimates were not calculated for the following parameters in Table V.A.1.a (1) in the Permit because all results were below detection limits: cyanide, total phenols, VOAs (Method 624), VOAs (Method 603), BNA (Method 625), PCBs, Pesticides, metals (except for zinc).

EMC's were calculated as the average of the wet-weather sampling event results in years 1-4 for each outfall. Wet-weather sampling event results that were below detection limits were included in the EMC calculation using a value of half the detection limit. Because the wet-weather sampling requirement can be completed from March 1 – May 31, this time period was used to calculate the seasonal pollutant loadings. During that period, 14.93" of rainfall occurred according to data from the National Weather Service station at the Springfield/Branson National Airport. For each outfall the pervious, impervious, and directly connected impervious percentages, curve numbers (CN), and basin areas listed in Table 7 in Section 6.3.2 were used. The runoff amount for each outfall for this period was calculated using the method described in Section 6.2.

	Ţ	Table 8	- Repr	esenta	epresentative Monitoring:	onitor		nbient a	and Wei	t-Weath	ier San	Ambient and Wet-Weather Sampling Results	esults			
Site	Date	Hd	ВОБ	GOD	TSS	TDS	NH3-N	N+N	TKN	dQ	ТР	CN	Phenolics	0&G	FC	FS
	11/7/05	7.34	<2	<10	<1	240	<0.1	0.38	<0.01	0.04	0.31	<0.005	<0.005	<10	20	09
South Creek at	3/9/9	8.08	<5>	6	<1	100	<0.1	0.1	0.1	<0.05	0.17	<0.005	<0.00>	<1	<10	<10
Golden Avenue	5/15/06	7.00	2	<10	<1	340	<0.1	1.35	0.16	0.02	0.07	<0.005	<0.010	<10	70	70
	5/22/06	6.92	3	<10	4	160	<0.1	0.84	1.51	0.02	80.0	<0.005	<0.010	<10	2400	4100
	11/7/05	7.13	<2	<10	^ 17	009	<0.1	0.81	<0.01	0.03	0.29	<0.005	<0.005	<10	30	100
Jordan Creek at	3/6/06	7.58	< 5	6	1	100	<0.1	0.44	0.07	<0.05	0.12	<0.005	<0.005	<1	10	<10
Bennett Street	5/15/06	7.31	3	<10	<1	480	<0.1	2.22	0.37	0.02	90.0	<0.005	<0.010	<10	70	70
	5/22/06	68.9	ъ	<10	2	100	<0.1	1.15	0.94	0.02	0.07	<0.005	<0.010	<10	2800	710
	11/7/05	7.32	<2	<10	^1	520	<0.1	1.06	<0.01	0.04	0.3	<0.005	<0.005	<10	40	40
Wilsons Creek at	3/9/9	7.83	<5	8	1	100	<0.1	0.63	<0.01	<0.05	0.17	<0.005	<0.005	<1	30	10
Farm Road 146	5/15/06	7.34	7	<10	<1	480	<0.1	2.58	0.08	0.01	0.03	<0.005	<0.010	<10	70	100
	5/22/06	6.95	3	<10	9	180	<0.1	1.49	0.15	0.03	0.12	<0.005	<0.010	<10	1700	2200
	11/7/05	7.57	<2	<10	\ \ 1	480	<0.1	1.19	<0.01	0.01	0.29	<0.005	<0.005	<10	30	150
Galloway Creek	3/9/9/	7.79	< 5	8	1	40	<0.1	0.54	<0.01	<0.05	0.19	<0.005	<0.005	<1	<10	30
at nignway 60 (JRF)	5/15/06	7.46	е	<10	1	380	0.11	2.91	0.17	<0.01	90.0	<0.005	<0.010	<10	200	250
	5/22/06	7.29	<2	<10	<1	220	<0.1	2.69	0.13	<0.01	0.1	<0.005	<0.010	<10	210	520
	11/7/05	6.55	<2	<10	2	009	<0.1	3.25	<0.01	<0.01	<0.01	<0.005	<0.005	<10	360	180
: : : : : : : :	3/9/9	7.15	< 5	9	<1	240	<0.1	3.13	<0.01	<0.05	0.14	<0.005	<0.005	П	20	<10
Sinds select	5/15/06	6.54	<2	<10	<1	440	<0.1	3.22	<0.01	0.02	0.05	<0.005	<0.010	<10	40	06
	5/22/06	6.11	2	<10	6	140	0.11	2.54	0.32	0.04	0.11	<0.005	<0.010	<10	2200	17400
	11/7/05	7.12	<2	<10	ю	009	<0.1	1.46	<0.01	0.06	0.32	<0.005	<0.005	<10	630	220
Des Bidae Creek	3/9/8	Dry Creek	ğ													
at Farm Road 102	5/15/06	7.21	<2	<10	2	470	<0.1	2.48	0.27	0.03	90.0	<0.005	<0.010	<10	330	220
	5/22/06	7.1	<2	<10	<1	200	<0.1	2.13	0.49	0.03	60.0	<0.005	<0.010	<10	3100	10900
4000			7 1 0		00 1/!	-										

Parameters are measured in mg/l (ppm) except FC and FS are colonies/100 ml.

Parameter Abbreviations: BOD = Biochemical Oxygen Demand; COD = Chemical Oxygen Demand; TSS = Total Suspended Solids; TDS = Total Dissolved Solids; NH3-N = Ammonia Nitrogen; N+N = Nitrite; TKN = Total Kjeldahl Nitrogen; DP = Dissolved Phosphorus; TP = Total Phosphorus; CN = Cyanide (Ammen); O&G = Oil & Grease; FC = Fecal Coliform; FS = Fecal Strep

-	Hardness	0 N/a	0 N/a	0 200	0 150	0 N/a	0 N/a	0 292	0 170	0 N/a	0 N/a	0 288	0 168	0 N/a	0 N/a	0 220	0 226	0 N/a	0 N/a	0 282	0 192	0 N/a		0 302	0 238	as Total
-	-	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50		<50	<50	ınalyses w
ults	BE	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20		<20	<20	2 20/6/5 pi
eather Sampling Results	SB	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20		<20	<20	3/23/05, ar
Sampi	AS	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20		<20	<20	or 3/8/05, 3
w cather	SE	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20		<20	<20	thod used for
מוות א כנ- א	HG	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	Metals. Me
The state of the s	AG	< 5	< 5	<5	< 5	< 5	< 5	<5	<5	< 5	<5	< 5	<5	<5	<5	< 5	< 5	\ 5 \	< 5	< 5	<5	V 5		< 5	< 5	s was Total
	Ĭ	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	<10	3/04 analysi
	PB	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20		<20	<20	used for 11/8
epresentative Monitoring:	8	< 5	< 5	<5	< 5	< 5	< 5	<5	< 5	< 5	<5	< 5	< 5	<5	< 5	< 5	< 5	V 5	< 5	< 5	<5	٧ 5		< 5	< 5	L. Method u
Lacarda	N	< 5	< 5	< 5	<5	<5	< 5	13.2	8.26	<5	< 5	8.4	8.88	< 5	<5	< 5	6.44	< 5	< 5	< 5	7.84	< 5		< 5	< 5	EQ CACO3/I
¦	R	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	Dry Creek	<10	<10	dness is Mg
Table	Date	11/7/05	3/6/06	5/15/06	5/22/06	11/7/05	3/6/06	5/15/06	5/22/06	11/7/05	3/6/06	5/15/06	5/22/06	11/8705	9/9/8	5/15/06	5/22/06	11/7/05	3/6/06	5/15/06	5/22/06	11/7/05	3/6/06	5/15/06	5/22/06	ug/l (ppb); hare HG and Total Dis
	Site		South Creek at	Golden Avenue			Jordan Creek at	Bennett Street			Wilsons Creek at	Farm Road 146			Galloway Creek	at Highway 60 (JRF)				Jones Spring			Pea Ridge Creek	at Farm Road 102		Metals are measured in ug/l (ppb); hardness is Mg EQ CACO3/L. Method used for 11/8/04 analysis was Total Metals. Method used for 3/8/05, 3/23/05, and 5/9/05 analyses was Total Recoverable Metals for HG and Total Dissolved Metals for all other metals. Hardness was voluntarily added to parameter list starting on 3/8/05,

Table 10 - Event Mean Concentrations and Seasonal Pollutant Loadings

Site	Value Type	BOD	COD	TSS	TDS	NH3-N	Z + Z	TKN	DP	<u>e</u>	0&G	S.	FS	N N
South Creek at	EMC	1.4	6	7	199	0.05	0.87	0.81	0.036	0.21	3.6	813	1355	2.5
Golden Avenue	Loading	3,013	20,270	15,887	434,983	110	1,906	1,764	62	455	7,834	17,804,727	29,692,807	2
								-						
Jordan Creek at	EMC	1.4	10	4	240	0.05	1.5	0.76	0.019	0.18	3.3	1105	538	6.42
Bennett Street	Loading	9'856	268'29	28,586	1,715,160	357	10,702	5,431	134	1,251	23,405	78,968,813	38,412,432	46
Wilsons Creek at	EMC	1.6	13	5	264	0.05	1.71	0.48	0.018	0.19	3.5	650	745	6.04
Farm Road 146	Loading	906′17	171,877	64,033	3,552,122	674	53,085	6,471	247	2,494	46,508	87,623,503	100,430,015	81
Galloway Creek	EMC	6.0	11	2	272	0.05	2.29	0.33	0.015	0.18	3.4	185	234	5.11
(JRF)	Loading	2,270	28,540	5,838	704,430	130	5,948	843	39	454	8,692	4,799,980	6,064,840	13
	EMC	1.1	14	7	270	0.07	2.72	0.32	0.029	0.2	3.3	1705	4780	5.19
fillide sallor	Loading	1,369	16,730	8,365	328,525	79	3,307	385	36	240	4,015	20,745,768	58,161,157	9
Pea Ridge Creek	EMC	6.0	11	4	302	0.05	2.03	0.8	0.024	0.18	3.3	1545	3780	3.34
at Farm Road 102	Loading	2,430	29,853	12,149	839,346	139	2,623	2,215	99	200	9,164	42,904,550	104,970,356	6

EMCs are in mg/l (ppm) except FC and FS are colonies/100 ml and Zn is ug/l (ppb). Loadings are in pounds/season (March – May).

Parameter Abbreviations: BOD = Biochemical Oxygen Demand; COD = Chemical Oxygen Demand; TSS = Total Suspended Solids; TDS = Total Dissolved Solids; NH3-N = Ammonia Nitrogen; N+N = Nitrite; TKN = Total Kjeldahl Nitrogen; DP = Dissolved Phosphorus; TP = Total Phosphorus; O&G = Oil & Grease; FC = Fecal Coliform; FS = Fecal Strep; ZN = Zinc

6.4 Floatables Monitoring

Two monitoring locations have been designated for removal of floatables as required in Part V.B. of the Permit. These locations were identified as points of significant accumulation of debris based on the experience of Public Works personnel and the frequency of citizen requests for cleaning at these locations. It is estimated that 12 cubic yards of floatables were collected from location 1 and 6 cubic yards from location 2 during year four. These quantities are lower than in previous years due to drought conditions resulting in decreased amounts of floatables washed into these locations.

- Location 1 Channel on the east side of Grant Avenue approximately 100 feet north of Portland Street
- Location 2 Detention basin at the southwest corner of Carleton Street and Bothwell Avenue



Figure 17 - Floatables monitoring location #1 at Portland and Grant



Figure 18 - Floatables monitoring location #2 at Carleton and Bothwell

Permit Reapplication: It is proposed that monitoring and reporting of floatables collected be discontinued due to limited usefulness as an indicator of SWMP effectiveness because of other factors, such as drought conditions, which influence the amount collected.

6.5 Biological Sampling

The City continued its annual biological stream assessment program in year four as required in Part V.C. of the Permit. Assessments were conducted, as was done in year three, on Jordan Creek at Bennett Street and Galloway Creek at James River Freeway. A third stream, Wilsons Creek at Scenic, was added to the program in year four. The City contracted with Missouri State University to perform these assessments. The report is included in Appendix B. Biological assessments will continue in year five.

Permit Reapplication: This activity will continue as proposed in Appendix D.

7.0 Summary of Modifications to the Storm Water Management Program

While it is anticipated that the current SWMP, which has served the public well, will follow the outlined activities of the Permit, City staff will continue to evaluate potential BMPs to further enhance water quality of the MS4. No modifications to the SWMP outlined in the current Permit are proposed at this time. A permit reapplication proposal is included in Appendix D for the five years following expiration of the current permit in July 2007.

8.0 Fiscal Analysis

		0.050				
Expense Item or Program	Funding Source ¹	Expenses FY 02/03	Expenses FY 03/04	Expenses FY 04/05	Expenses FY 05/06	Estimated Budget FY 06/07
Hard Costs ²						
Staff: 2 full-time staff, mgmt and admin staff, 1 intern	SWBI, GF	76,000	82,000	67,000	88,000	90,000
Supplies & Equipment	SWBI, GF	10,000	3,000	6,000	1,900	5,000
GIS hardware/software	SWBI, GF	4,000	5,000	8,000	8,000	10,000
Training and Professional Services and Studies	SWBI, GF	30,000	43,000	68,000	151,000	100,000
Lab Services (sample analysis)	SWBI, GF	44,000	44,000	44,000	44,000	44,000
Education and Public Outreach	SWBI, GF, SSF, TF, LTF	1,869	2,500	9,900	7,200	8,000
State Permit Fee	SWBI, GF	2,350	2,350	2,350	2,350	2,350
Total		\$168,219	\$181,850	\$205,250	\$302,450	\$259,350
Soft Costs ³						
Water Quality Improvement Projects	SWBI	653,615	800,000	1,200,000	1,150,000	1,000,000
Vegetation Management of Waterways & Basins	DBF, TF, GF	543,975	209,187	112,267	125,071	101,000
Tree Planting & Maintenance	GF	496,450	618,235	568,352	533,319	616,400
Solid Waste Division Education Program w/ water quality emphasis	LTF ⁴	38,900	40,870	46,000	46,000	66,000
Household Chemical Collection Center	SS(50%), LTF(50%)	104,500	111,713	94,500	94,500	118,500
Yardwaste Recycling Center	LTF	348,000	238,977	329,000	329,000	336,000
Infiltration/Inflow Program	SSR	1,286,471	783,150	457,000	338,000	600,000
Floodplain Acquisition Program	SWBI	856,750	488,585	938,550	1,349,570	1,000,000
Debris collection – grate, waterway, bridge, and sinkhole routes	TF	30,000	98,382 ⁵	114,888	33,200	126,400
Street Cleaning ⁶	TF	491,000	462,842	563,734	610,473	650,000
USGS Coop. Stream Gauge	SWBI	17,300	17,300	18,600	25,600	25,600
Watershed Committee of the Ozarks	GF	41,000	41,000	41,000	47,000	47,000
James River Basin Partnership	GF	5,000	5,000	5,000	5,000	5,000
Total		\$4,912,961	\$3,915,241	\$4,488,891	\$4,686,733	\$4,691,900
Grand Total		\$5,081,180	\$4,097,091	\$4,694,141	\$4,989,183	\$4,951,250
4-Year Total Expenses					\$18,861,595	

¹ SWBI – Storm Water Bond Issue funded by Level Property Tax; GF – General Fund; SSF – Sanitary Services Fund; TF – Transportation Fund; LTF – Landfill Tipping Fees; DBF – Detention Buyout Fund; SSR – Sanitary Sewer Revenue

² Hard costs are expenses for activities conducted solely for the purpose of compliance with Permit requirements.

³ Soft costs are expenses for activities that are part of the Permit requirements and/or overall SWMP, but would be conducted by the City regardless of the Permit. Expenses do not include capital purchases, except vegetation management in 02/03 may include these, accounting for the significantly higher expenses than in subsequent years.

⁴ A small portion of funds for the Solid Waste Management Division Education Program, HCCC, and YRC comes from donations and from the sale of YRC products.

⁵ The actual expenses for fiscal year 03/04 are an estimate based on expense records for December-June. MoDot conducts curb inlet cleaning of state-maintained thoroughfares within the City limits.

⁶ Includes personnel, services, and supplies for all street cleaning activities including sweeping, debris pickup, grate cleaning, and vacuuming ditches. Additionally, MoDot spends approximately \$30,000 on sweeping state-maintained thoroughfares within the City limits.

9.0 References

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Soil Conservation Service. 1986. <u>Urban Hydrology for Small Watersheds.</u> United States Department of Agriculture. Washington, D.C.

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